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The Farmer's Digest

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United States Department of Agriculture

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Calves Helped Solve a Feed and Fertilization Problem

Condensed from Better Crops With Plant Food

E. R. Kuck

Brookside Farms, New Knoxville, Ohio

THIS story has its setting in the combination calf and maternity barn, built in 1945 to better control the hazards involved in the birth of calves and in bringing them through the critical first 60 days of life. Great care was exercised in the planning of this building, particularly with regard for ample space, provision for proper lighting and ventilation, and a type of construction which would lend itself best to thorough sterilization and fumigation. The reason for this enterprise was to substantially eliminate the high mortality rate (23% to 41% annually) among our new-born calves.

Title to Brookside Farms, New Knoxville, Ohio, was acquired in 1933 and a general farming program featuring a pure-bred Guernsey dairy herd, pure-bred Poland China hogs, and a 500-layer flock of White Leghorn chickens was inaugurated. The farm originally consisted of 180 acres in two units. Subsequently three additional farm units were leased, involving an additional 240 acres. Much of this land has been in cultivation for 100 years and the soils are principally Miami silt loam, Crosby clay loam, and some rich Brookston loam.

Having had the advantage of an agricultural college training (Purdue 1920-Ohio State 1922) and having a natural inclination to scientific study, I introduced all the latest ideas and procedures in soil and animal husbandry that came to my attention. Careful records concerning each enter-

Reprinted by permission from Better Crops With Plant Food, Washington, D. C., December, 1946

prise have been kept since 1933.

However, the employment of all the latest scientific principles involving poultry, swine, and dairy cows did not permit me to fare any better than most of my neighbors. A high mortality rate with young chickens caused me to drop the poultry program in 1939. A high mortality rate with pigs caused me to abandon the swine-breeding program in 1940. Today the entire farm program at Brookside Farms is devoted to dairying, only in this we have had no small amount of discouraging experiences, especially with a high mortality in young calves, with mammary disturbances in the milk cows—both milk fever and mastitis—and, of course, the ever-present problem of shy breeders.

The foregoing background brings us to the present status of Brookside Farms with a normal milking herd of about 100 head of milk cows, 50 bred heifers, 70 open heifers, and about 40 head bull calves. All of these animals excepting the bull calves, are grown to maturity and given an official production test during their first lactation period, after which they are sold on the basis of an automatically applied price formula based on the pounds of butter fat produced.

Under the above program there are approximately 120 calves born each year. When 49 of these calves died in one year it was not only a disappointing experience but it also represented a real economic loss. It was because of this heavy mortality rate that the modern calf and maternity barn was planned and built.

This barn 28′ x 72′ was constructed of clay tile building-blocks with all the inside walls plastered with a two-coat plaster application. Ample window lighting and ceiling ventilation were installed. The barn was started in November, 1944 and was put in use about April 15, 1945. All the walls in the 16 individual calf stalls were given a rough coat plaster application and six of these stalls were given a finish coat plaster application. The other 10 stalls were not completed with the finish coat until the latter part of October, 1945. All of the stalls were promptly put in use, but our experience with the calves remained the same. They kept right on dying.

The following symptoms prevailed: Calves were born weak with slow reflexes and no appetite; dietary scours developed in 100% of the cases, 50% of the cases were accompanied with low type of pneumonia with much coughing; calves that died invariably went down with convulsions and no calf ever to go into the convulsion stage lived beyond six hours. Strong, disagreeable odors

always were present in the stalls. Calves that lived through the first 90 days showed remarkable recuperative ability and matured to good size without any signs of these calfhood disorders.

Thousands of dollars were spent to find a practical cure. Every type of treatment involving the entire list of sulfa drugs, vitamin tablets and vitamin preparations of every description, blood transfusions from the mother, calf scours serums and vaccines, modification of the milk formula graded down to pure skim milk, special pre-natal feedings to the mothers—all of these were tried with no change in the general results.

As previously explained, six of the calf stalls had been completely finished with the finish plaster coat and the other 10 had only the rough coat application. The observation that, for some reason, the calves were severely mutilating the finished walls in each of the six finished stalls was almost immediately made. No particular thought was given to this at first except as to whether it would pay to have the other stalls finished if the calves would mutilate the walls any way. Then one day the belated thought came to me: Why are those calves trying to eat the finish coat from the wall? Close inspection revealed that the rough-coated walls had not been touched.

A partially filled bag of the material used for the finish plaster coat was at hand and I requested the manufacturer to send me a detailed chemical analysis of the materials used in this finish lime material. Considerable correspondence followed and it was learned that this material was prepared from a heavy dolomite lime analyzing:

Calcium Carbonate $CaCO_3$	53.94%
Magnesium Carbonate $MgCO_3$	45.47%
Other elements	.59%
	100.00%

This company also sent their chemist to our farm where for several days we made exhaustive soil tests from all our fields and found the results shown in the accompanying table:

The natural deduction, based on the foregoing information, led me to assume but one answer—the element magnesium. A carload of this material was immediately ordered with 4 tons of the material ground to a fineness to go through a 200-mesh screen for mineral supplement feeding and 40 tons to go through a 100-mesh screen for pasture and field application. The car was unloaded August 25 and our extensive experiments started from this date.

Regardless of season, it has been our custom to feed a grain ration supplemented to provide a 16% protein ration. The supplement used was manufactured by

Element	No. of samples	Lowest reading	Highest reading	Average for farm
pH	17	5.4	7.2	6.36
Nitrogen (Parts per M)	17	25.0	60.0	35.0
Phosphorus (# per acre)	17	50.0	100.0	70.0
Potassium (# per acre)	17	120.0	220.0	180.0
Magnesium (# per acre)	12	very low	low	very low plus

a nationally prominent feed manufacturing concern and was guaranteed to contain the mineral elements necessary to heavy milk production. Nevertheless, we always added to this ration an additional 40 lbs. per ton of a mineral mixture made up as follows: 40 lbs. of 98.4% pure calcium carbonate, 40 lbs. steamed bonemeal (or 40 lbs. defluorinated di-calcium phosphate if bonemeal was not available), and 20 lbs. of salt. This formula has not been varied since 1938.

On August 25 I ordered a change in this home-mixed mineral as follows: Substitute dolomite lime (54% $CaCO_3$. 45% $Mg\ CO_3$) for the pure 98.4% calcium carbonate used previously and add 40 lbs. additional dolomite lime to each ton of feed mixed.

This order was predicated on the assumption that the calcium carbonate content would remain about the same as with the 98.4% pure calcium carbonate used before, but the additional amount of magnesium carbonate would be fairly high.

All the calves in the calf barn were fed milk from the cows receiving this new mineral mixture. After about two weeks it was noticeable that the odor previously present in the stables was becoming less, and we noticed a considerable change in the droppings of the calves. We also noted a gradual increase in the thirst for water on the part of the calves between feedings. The calves became more alert and, as if by magic, the scours condition cleared from the older calves. The calves just born, however, still proceeded through the scours stage but soon recovered when put on milk. During the latter part of October the remaining 10 stalls were treated with the finish lime coat, using the same material as was used for the first six stalls, and not a single toothmark is seen on any of these walls to this date.

At this point we were satisfied that we had made a very impor-

tant discovery. Then followed a long list of experiments that are still in progress, some with very illuminating and striking evidence of the importance of the proper balance and the interrelationship of certain major and trace elements.

1. On August 25, there were 16 cows in the milking herd quarantined for mastitis. On September 15, 13 of these animals were entirely cleared without any other treatment. On October 5, a herd test was made involving 79 animals, only 2 reactors were found and they showed slight traces in one quarter. Today there is not a single animal in quarantine for mastitis on the farm. Previously the incidence of mastitis would affect better than 50% of the herd at one time or another during a lactation.

2. On August 25, we were carrying on our No. 2 farm 23 head of dry cows that had completed good production records but which we had not been able to breed. The pasture on this farm was treated with a 700-lb. application of the dolomite lime on August 27. Excellent fall rains produced a good pasture during the latter part of September and these cows ranged this pasture until in December. In addition, they had free access to the mineral in special boxes in the barn. On January 8, 1946, when these animals were bled for our periodical Bangs and TB test, 18 of them were pronounced safely with calf by the veterinarian and 20 have subsequently calved on dates showing they were bred about October 1 or after. The same bull accompanied these cows throughout the year.

3. Milk cows that had been on the dairy mineral feed for at least two months before they were turned dry produced strong, normal calves that did not go through the scours stage. Check cows and heifers that did not have the advantage of the mineral mixture dropped weak calves and gave the same symptoms and results as before.

Field Crop Observations

The most striking evidence of the effect of this magnesium element remained to be found in the crops from the dolomite-treated fields. In an abnormally wet spring season, followed by one of the most severe droughts in late summer ever experienced in my immediate community, the results could be read without effort. The outstanding observations were briefly, as follows:

1. Because of an abnormal rate of rainfall following corn-planting season, the corn fields generally presented a mottled array of colors—a patchwork ranging from yellow to dark green. This phenomenon was attributed to drowning and excessive rainfall.

However, these yellow areas were evident on high ground as well as in depressions. On the dolomite-treated fields, the corn retained a uniformly green color and the yellow spots were not evident except in a few isolated places where plants were in water for three or four days. However, it was noticed that these plants had a remarkable recuperative ability.

2. Where nearly all of the untreated corn fields in the immediate community were severely fired, the dolomite-treated 120 acres of corn on this farm remained green throughout and made a highly increased yield over the average of the community.

3. Following the third cutting of alfalfa hay the stand, generally, turned yellow and brown, giving the appearance of being dried up. The dolomite-treated fields are going into the winter with a healthy, dark-green color.

Indiscriminate use of magnesium salt may result in detrimental effects both to animal and plant health. Magnesium absorption beyond the optimum point in animals may produce a disease known as magnesium tetany, while overuse of it in the soil shows evidence of lowering the potassium intake of plants and will cause potash starvation. Much is still to be learned about this element but all indications point to a triumvirate relationship existing between calcium, magnesium and phosphorus in such balance as these elements are found in nature, as, for example, in the egg shells of wild birds.

Corroboration

If this narrative has given you the impressioin of being a fairy tale, I do not blame you. I have merely set forth the facts as they have appeared at Brookside Farms. More than 30 eminent agronomists and scientists have visited the farm to see and study this peculiar problem.

I wish particularly to thank Dr. Fred Boyd, Agronomist and Midwest Representative of the American Cyanimid Company and Dr. G. N. Hoffer, Agronomist and Midwest Representative of the American Potash Institute, for their keen interest and active cooperation in this problem. Their on-the-spot analyses of soil and tissue samples have thrown much light on this subject. Their findings will be published after further experimentation is completed. However, it may be safely stated that from the evidence at hand magnesium plays an important role in plant, animal, and human life as do the other better known elements—nitrogen, phosphorus, and potash.

Swine Nutrition

Condensed from Hog Breeder

Damon Catron

Assistant Professor of Animal Husbandry, Iowa State College

EVERY farmer can influence his profits from his hog business by doing an efficient job of breeding, feeding and management. As feed makes up over 80% of the cost of producing pork, it would seem that the field of swine nutrition, including efficiency of feed utilization and feed cost per 100 lbs. of gain, is a mighty important one to every hog producer. The final measuring sticks of good feeding are: (1) Pounds of pork marketed per sow, (2) Feed cost per hundred pounds of gain, and (3) Time required to produce a 225 lb. market hog.

Improving swine feeding in the Cornbelt merely means finding better and more efficient ways to supplement the protein, vitamin and mineral deficiencies of farm grains—primarily corn. This job of successfully and profitably supplementing corn under various feeding conditions to various stages of swine production is not as simple as once thought. We are still faced with the facts that producers are only marketing about 6.5 pigs out of every 10 farrowed. The amount of feed required to produce 100 lbs. of pork is much too high, both of which may be attributed, in part, to poor feeding. Many apparently good rations which once performed satisfactorily on pasture are failing on the concrete feeding floors of Iowa farms. We still have much room for improvement through the application of known and yet-to-be-discovered facts.

In the past we have thought in terms of kind and amounts of ingredients as the basis for formulating and evaluating protein supplements. In the chemical analysis and assay of a feed, it is kinds and amounts of nutrients found in the ingredients which do an efficient job of production when fed to animals. Animal proteins, like tankage and meat scraps, are thought to be much superior to plant proteins, such as soybean oil meal, as a protein supplement. Now we know that part of this superiority is due to the B-complex vitamins contained in the animal proteins.

Corn is an ingredient, but it

Reprinted from the Hog Breeder, Chicago, Illinois, December, 1946

does not always contain the same amount of various nutrients. I have seen protein analysis on corn run from 5.5 to 18.0%. One of the greatest mistakes made today by many swine men, is that they recommend alfalfa meal be included in drylot swine rations without specifying that it be high quality alfalfa meal. That alfalfa meal is going into that drylot ration because it is supposed to furnish needed water soluble (B-complex) vitamins and carotene. I have assays of alfalfa meals that vary from 9 to 33 gamma per gram in Riboflavin and from 55,000 to 250,000 units per pound in carotene (pro-vitamin A). The quality of alfalfa meal ground from home grown hay varies greatly in vitamin content depending upon the manner in which it was harvested and stored. Genetics, soils, climate and methods of harvesting, storing and processing all affect the nutritive composition of ingredients.

Recent work at the Illinois Station indicates that the growing period up to about 75 pounds is a nutritionally critical period, especially under drylot conditions. Apparently good rations formulated from natural ingredients and adequate in protein, energy, minerals, the fat soluble vitamins (Vitamin A and D) and the better known water soluble vitamins (B-complex vitamins) have given very poor results for pigs under 75 pounds.

It was found that the addition of 10 to 12% of high quality alfalfa meal, or its equivalent in water soluble vitamins, to these inadequate rations made them nutritionally adequate. It is apparent that alfalfa contains not only some known, but also unknown B-vitamins needed by young pigs for livability and satisfactory growth.

The growing-fattening period from 75 pounds to market, even under drylot conditions, is not considered a critical period from the nutritional standpoint. Support for this statement is found in the fact that rations which did poorly in drylot when fed to pigs up to approximately 75 pounds were quite satisfactory for pigs weighing more than 75 pounds. This indicates that rations for older pigs do not have to be as carefully formulated as appears necessary for the younger group. Neither is it so difficult to formulate satisfactory supplements for growing-fattening pigs of all ages on pasture.

There are as many as 13 different mineral elements required to maintain an animal in good health. For production, above maintenance, the requirements for calcium, phosphorus and salt are those that are greatly increased. When the composition of gains is analyzed, we find

that the young rapidly growing pig, weighing 25 to 50 pounds, requires from 15 to 20 times as much minerals as does a hog weighing 200-225 pounds. It has been thought that the requirements for the necessary trace elements for swine have been met when rations, made up of commonly used ingredients, are fed on good pasture. Yet nutritionists are becoming more aware of the possibility of trace element deficiencies in certain areas and especially under continuous drylot feeding conditions.

Early work at the Iowa Station, and recently confirmed by workers at Purdue University, shows the indispensible, yet often overlooked, importance of salt for swine. When comparing lots of pigs fed salt with those fed no salt, they found that 1 pound of salt saved between 213 to 287 pounds of feed.

Many feeders prefer to grind their grain and mix it with the protein supplements. For satisfactory results, it is quite important that a sufficient amount of protein supplement be mixed with the ground grain. The Minnesota and Illinois Stations have done some work on protein levels for growing-fattening pigs and they agree, in general, as to the amount of protein required in the total ration. The suggested protein levels in the total ration are as follows:

In Drylot	*On Pasture*
20-22%	16-17%
17-18%	14-15%
15%	12%
12-13%	9-10%

Many farmers have been turning to the use of concrete lots to overcome swine diseases, parasites, water hauling and fencing problems. This definitely creates nutritional deficiencies which are new experiences for many. Most of these deficiencies show up in the drylot during the critical period below 75 pounds. Many rations which once gave excellent results in pasture feeding result in slow growth rate, scouring and high death losses under drylot conditions. Soybean oilmeal, fed as a protein supplement to yellow corn, wheat midds, minerals and codliver oil to young pigs below 75 pounds in drylot, resulted in growth failure and death losses as high as 75%. When 10% high quality alfalfa meal was added to this ration, growth was still slow but alfalfa reduced the death loss to 36%. This indicates that soybean oilmeal alone is unsatisfactory for young pigs in drylot when supplementing commonly used ingredients. Even with the addition of high quality alfalfa meal to such a ration, something else must be added if we are going to get satisfactory gains and livability.

To further illustrate the defi-

ciencies of so-called good rations when fed to young pigs below 75 pounds in drylot feeding, the Illinois Station fed a ration of yellow corn, wheat midds, soybean oilmeal, tankage, fishmeal, minerals and codliver oil. This ration contained 11.5% tankage and fish meal. These pigs gained only .79 pounds daily, the death loss was 31% and the pigs were not normal in legs, skin or hair. Good pasture performance was approached only by adding 10% good alfalfa meal to the ration which increased gains 40% and cut death losses down to 18%. As yet we have been unable to formulate rations for continuous drylot feeding which give as satisfactory a performance as less expensive rations have performed on pasture. Pasture feeding not only covers up a lot of drylot feeding sins, but it can save 25 to 50% of the protein supplement and up to 15% of the grain needed in pork production.

It is now known that pigs have the ability to store water soluble as well as fat soluble vitamins in certain tissues in their bodies when liberal amounts are fed. These "storehouses" may be used to "tide them over" later when rations are fed which are inadequate in these stored factors. The "carry-over" effect of pasture feeding can readily be seen in drylot feeding by comparing pigs which had access to pasture during the nursing period with pigs which were raised in drylot.

In the past, the swine industry has been a one supplement industry. If the nutritional requirements vary as much as the most recent investigational work seems to indicate, then it appears that we need to formulate specific supplements for specific purposes. If a protein supplement is manufactured satisfactory for pigs at the lighter weights, then it is too good for pigs nearing market weight, and the farmer may be paying for a better supplement than he actually needs. On the other hand, if it is only satisfactory for the heavyweight pigs, then it is not good enough for the young pigs. It might be wise to formulate three different supplements for growing and fattening pigs—one for young pigs up to 75 pounds, another for growing fattening pigs from 75 pounds to market fed in drylot, and the supplement for growing fattening pigs from 75 pounds to market fed on pasture.

It seems to me that it would be wise for the feed industry to sell the swine feeder, like they have the poultry feeder, a feeding and management program and not just a bag of feed! With this feeding program should come accurate, easily understood feeding directions. Research workers may painstakingly work out the

specifications for proper swine supplements, the feed manufacturer may formulate and build these supplements accurately, but if they are sold to the farmer without feeding directions, maximum performance in the feed lot cannot be expected.

Although much swine feeding experimental work has been done, much yet remains to be learned. Here are only a few of the problems on which we need to do more work:

1. What influence do various rations have upon the biosynthesis of vitamins in the intestinal tract?
2. What are the exact nutritive deficiencies causing high baby pig mortality, and what are the fundamental causes of "baby pig diseases?"
3. What are all the nutritive requirements of the various ages and weights of pigs in drylot?
4. What is the relationship between nutrition and various swine diseases like necrotic enteritis or brucellosis?
5. What effect does soil fertility and fertilization have upon the nutritive value of common swine feed ingredients?
6. To what extent can the nutritive value and the quality of pork be improved by feeding?
7. New feeds, by-products from many industries, have and are appearing. How can they best be formulated into swine rations?

These and many similar questions must be answered before we can formulate the most efficient and most economical supplements for hogs.

Corn Borer

The number of borer larvae in a cornfield can be reduced about 3 per cent for every day that planting is delayed. One Ohio field planted May 7 yielded about 20 bushels of corn per acre, and had from 18 to 20 borers in each stalk. An adjacent field planted May 21 on equally productive soil produced 100 bushels per acre and carried two or three borers per stalk. The corn-borer moth selects early corn for egg laying, and a higher percentage of the larvae hatch and survive than when eggs are laid on corn planted later.

—*Successful Farming*

Adequate Feeding of Breeding Ewes Will Prevent Pregnancy Disease

Condensed from Farm and Home Science

Wayne Binns

Utah Agricultural Experiment Station

PREGNANCY disease of ewes is one of the more important sheep diseases in Utah and results in high economic losses to sheepmen each year. It is difficult to estimate the annual loss, but it averages 5 per cent, and in some flocks it reaches 10 per cent or higher. At the present value of sheep, the loss amounts to about $100,000 annually.

Ewes from four to six years of age and carrying more than one lamb are more commonly affected. Twinning is more common in ewes of this age and they usually lack some of the vigor and strength of younger ewes. Only on rare occasions have the symptoms been reported in young pregnant ewes. Usually the ewes are in the fourth or fifth month of pregnancy when the disease occurs. A ration inadequate to support the demands made upon the system through the gestation period, especially during the last two months, is the primary cause of this disease. For many years it was thought that lack of exercise was one of the contributing causes, but in 1942 studies reported by O. M. Muth and J. M. Shaw, of the Oregon Agricultural Experiment Station, showed this not to be true.

The onset of the disease is gradual; the first noticeable symptoms are the refusal of feed and water. The affected individual will be found standing by itself away from the rest of the herd for long periods of time, grinding its teeth and twitching its ears. In 12 to 24 hours the animal becomes depressed and pays no attention to persons approaching and may show a marked nervous disturbance, such as walking in a circle, standing with its head pressed against some object in the pen or turned to one side. The animal soon loses control of its legs and goes down on its side. Its head may be pulled to one side and it may remain quiet in a comatose con-

Reprinted from the Utah Agricultural Experiment Station Bulletin, "Farm and Home Science," December, 1946

dition or show continual walking movements with its legs. It may remain in this state from two to several days before dying. Occasionally the affected animal will give birth to her lambs in the early stages of the disease and gradually recover. But recovery in the advanced stages of the disease is rare and the occasional animal that does get well gives little or no milk and is unable to support her lambs. The blood, urine, milk, and saliva from affected individuals show the presence of ketone bodies, of which acetone is the principal one.

The postmortem findings on ewes that have died from this disease invariably show two or more lambs on examination and a marked yellow coloration of the liver, called fatty degeneration.

In the early stages of pregnancy disease when the animal begins to show ketone bodies in the blood and urine, and before marked external symptoms appear, the administration of sugar solutions, corn syrup, or molasses have been beneficial. In the advanced stages treatment is of little value.

Prevention of the disease lies not in administering medicinal agents to the susceptible animals, but in proper feeding of adequate rations to all pregnant ewes during the gestation period.

Preventive measures should begin when sheepmen pick out the ewes for breeding stock. Only strong, vigorous ewes that will be good feeders should be kept. These animals should then receive all the good quality alfalfa hay they will clean up, which will be from 3½ to 4½ pounds per head per day, and one-third pound of grain per head daily. During the last two months of the gestation period the grain ration should be increased to ½ pound per head daily. Plenty of feeding space should be provided so all animals can get up to the manger at the same time without crowding. Clean, fresh water and coarse ground iodized salt should be available at all times. Each ewe will consume about one-half ounce of ground salt a day, which is important to stimulate water consumption, which in turn insures proper digestion of food and elimination of waste products. Without a sufficient water intake, the amount of dry feed consumed will be greatly limited even though there is a good quantity and quality offered.

Animals on the above type of ration should show a 12 to 15 pound monthly gain in body weight. To insure that their sheep are making proper gains, sheepmen should weigh certain individuals each month, and if the gain in body weight is not being made, the ration and feed-

ing conditions should be changed so as to insure the proper gain.

The weight of the uterus and its contents at lambing time in a 100-pound ewe is about 25 pounds. If the total gain in weight for the last two months of the gestation period does not increase at least this amount in the ewe carrying twins, she will be forced to draw upon her body reserves and will be in danger of contracting pregnancy disease.

It is difficult to realize the importance of proper feeding of pregnant ewes without first having some understanding of the physiological process involved in pregnancy. Pregnancy is a critical period for the ewe. In addition to nourishing her own body including the fleece, she is furnishing food for the development of the unborn lamb. During the last two months of the gestation period, the developing lambs grow rapidly and exert heavy demands upon the ewe. If she does not get the necessary food requirements to satisfy the demands made upon her system, she must utilize her own fat, and before the fat can be completely utilized in her body, carbohydrates must be present. The carbohydrates that are taken into the body in excess of the amount necessary for maintenance are stored in the liver and body tissues in the form of glycogen. When the carbohydrate supply is insufficient in the feed to meet the body requirements, the stored glycogen is broken down and used as energy-producing materials for the body as an aid in the metabolism of fat, and it also assists in eliminating poisonous substances. But the stored supply of glycogen soon becomes exhausted when there are insufficient amounts of carbohydrates in the ration and the fat is only partly utilized. The un-utilized portion of fat is the ketone bodies which accumulate in the blood and body tissues. These bodies are poisonous to the animal and when they become highly concentrated they cause the symptoms observed in pregnancy disease. The exhaustion of glycogen in the liver causes replacement by fat and this inhibits the liver from eliminating the poisonous ketone bodies and results in the poisoning of the animal and causes the yellow coloration of the liver found on postmortem examination.

There is no other farm animal that is expected to produce more in such a short time than a ewe carrying two or more lambs, so she should be fed accordingly.

Radiant Heat for Brooding

Condensed from Everybody's Poultry Magazine

L. M. Hurd

RADIANT heat for brooding is one new idea that seems to have found a permanent place in the commercial poultry industry. On Long Island, one of New York state's largest broiler growing areas, it is in use on many broiler plants, on a duck farm, and on a turkey farm. Some Pennsylvania growers have put it in, and even up in conservative New England they're using it, with all the latest refinements.

The first installation in the Long Island area was on the duck farm of H. F. Corwin & Sons in Suffolk County. Mr. Corwin read a magazine article about radiant heat for factory workers, was interested immediately, and decided, after much thought and consultation with heating engineers, to take a chance on installing it in his duck brooder house, since he was not wholly satisfied with the hot water system he was using.

This was four years ago. Today, all of Mr. Corwin's brooder houses are equipped with radiant heat, and he is an enthusiastic advocate of the method. It has revolutionized the brooding of ducks on his farm. Instead of putting 250 to 300 ducklings in small pens, he now raises from 5,000 to 7,000 ducks in one pen.

It was not long after Mr. Corwin started brooding ducks with radiant heat that a few of the broiler growers nearby heard about it and decided to try it with broilers. Mr. Christo B. Tsantis, owner of the Crown Poultry Farm was one of the first broiler growers to make an installation. This will be his second year with radiant heat. Mr. Tsantis has radiant heat in two broiler houses which he built to replace two large houses which were destroyed by windstorms on New Year's Day in 1945. The new brooder houses are 20 feet wide. One is 200 feet long, and the other 135 feet long.

The 200-foot brooder house is divided into nine pens, each 20 feet square. The shorter house has six pens. When the chicks are put in the house the temperature usually kept at the floor is about 90 degrees, though this varies among growers. Many watch the chicks and regulate the heat accordingly. The temperature is reduced until during the last four weeks of the growing period it is about 75 degrees. A wall thermostat is used in each

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house to regulate the temperature. The heating system is kept in operation 24 hours daily the year round.

Mr. Tsantis is very enthusiastic about the results of radiant heat. He says there is a noticeable improvement in the size of cross-bred cockerels at 12 weeks over what they were when he used individual stoves for brooding. There is also a marked difference in the mortality rate and fuel costs are less. Insurance rates are lower than when he used individual brooder stoves.

Mr. Tsantis estimates that the cost of the boiler, pipe, and labor for installing radiant heat in his two houses amounted to about $3,000.

Although radiant heat has been used to a limited degree in homes, so far as anyone knows it never has been used to any great degree in poultry houses until recently. Because of this, heating engineers have not been too sure of the proper set-up for brooder houses. At first, there was considerable difference of opinion as to the size of pipe to use, the thickness of the concrete covering the pipes, the proper temperature of water to be maintained in the boiler, and the way the water should circulate to give the most uniform temperature in all parts of the building. However, observations and the experience of those who have had this system in operation for a year or more seem to have brought out a few fundamental facts.

Most of the Long Island growers use 1-inch wrought-iron pipe, although the size used varies from ¾ to 2 inches. In converting old houses, the pipe is laid on top of the concrete floor and is then covered with concrete to a depth of 1 to 3 inches. If a new building is being constructed, a layer of concrete 3 or 4 inches thick is first laid down on a well tamped foundatioin of crushed stone, cinders or gravel. The pipe is then laid on this base and covered with concrete to the proper depth. It is customary to pour the concrete while the water in the pipe is hot, though some growers report satisfactory results where the pipe was cold when cement was poured.

No one in the Long Island area has tried radiant heat on wooden floors, but two installations in Pennsylvania indicate that it will work. A strong mixture of concrete needs to be used and the floor should be well supported to carry the weight of the pipes and concrete. Mr. W. F. Wilmarth, a Pennsylvania poultryman, who has recently made such an installation on a wood second floor of one of his houses, is convinced it will be successful. He says it is necessary to support 40 pounds of weight for every square foot of floor space in this house.

According to the heating engineers the coefficient of expansion of wrought-iron pipe and concrete is practically the same. This makes concrete an excellent material to use around the pipe.

Since the pipes are to be buried in concrete, it is well to have the system set up and tested out for leaks before the concrete is poured. The engineers say that iron pipe laid in concrete, as described above, will probably last for as long as 40 years.

The inch pipes are usually connected with a manifold or header on each end of the house. It is best to have two separate sets of manifolds so that the hot water in one-half of the floor will circulate in the opposite direction from that in the other half. The boiler should be located in a pit near the center of the building or at the end of the house, depending on its length. The hot water flow pipe from the boiler usually rises straight above the boiler to the roof or ceiling of the building on the better installations and then runs the full length of the building. A branch pipe from the flow line feeds down into the manifold on the side of the building on the end of the pen nearest the boiler, so the flow of water will be toward the far end of the pen. From this point the water is returned to the boiler by means of a main which passes under the floor.

The pipes on the other side of the building receive their supply of water on the far end of the pen. The water flows in opposite directions on each side of the building, and enters a manifold which tends to overcome any variation in temperature of the floor.

In some installations a "U" system has been used, in which each pipe completes a circuit, but the use of headers seems to be preferred.

Experience indicates that it is best not to attempt to heat too long a pen. Probably 300 feet is the limit and 200 feet is better. This is because the water temperature may cool down too much. One reason for having the hot water flow pipe from the boiler circulate through the top of the room is so water can circulate by gravity if electrical power to the circulating pump, which is usually used, fails. Most operators use a thermostat and locate this anywhere from 1 foot to 4 feet from the floor. In ordinary weather, most operators carry the water temperature at the boiler at 140 degrees. In cold weather, this temperature may run up to 180 degrees, though some engineers believe temperatures this high are not necessary if the system is properly installed.

Many different systems of ventilation are in use. Most broiler growers divide the house into pens about 20 to 25 feet square

and put in anywhere from 500 to 800 chicks to a unit. If the larger number is started, part of these chicks are removed at 4 to 6 weeks. None of the Long Island broiler growers has removed the partitions in the house, letting the birds run together, but experience with one batch of 28,000 broilers run in two floors of a long house on the Red Rose farm near Lancaster, Pennsylvania, shows that open-pen brooding with radiant heat will work. The great advantage of this system is in the saving of labor.

In no instances are any hovers used. Most growers have automatic water supplies with waste disposal and two or three use carriers, which save considerable labor.

The brooding of turkeys with radiant heat has been successful on the McDonald Farms on Long Island. This farm usually puts out about 20,000 turkeys a year. About 250 poults are placed in one unit and kept there until they are ready for the range. Losses have been very small, and the birds have grown exceptionally well. After talking with the Long Island broiler growers and others, I am firmly convinced that radiant heat is here to stay and that it will revolutionize the growing of broilers, turkeys, and ducks especially where large numbers are grown. Although little attention has been given to raising chickens for replacement by this method, I see no reason why it cannot be used successfully.

Anyone contemplating using this system should consult a competent heating engineer. This is the first recommendation of most of the growers for those who may think of putting radiant heat in their houses.

The principal advantages of radiant heat can be listed as follows:

1. It saves labor because there are no obstructions such as hovers in the pens to interfere with cleaning and other work. Care of individual stoves and brooding equipment is eliminated.

2. It saves labor in changing litter and reduces the cost of litter because frequent cleaning is not required.

3. It provides more uniform heat.

4. Less coccidiosis is likely to appear, since it is possible to keep the litter dry at all times.

5. It will permit brooding chickens, ducks and turkeys in large flocks without the danger of crowding.

Direct Seeding Tool

Condensed from American Forests

Arthur W. Priaulx

With the aid of a relatively simple tool, which resembles a walking stick, one man in a day can plant seed on from three to five acres of burned-over, non-restocked forest land. Hailed as a great potential boon to forestry, the Oregon direct-seeding tool, designed by members of the Oregon State Department of Forestry, stands today after three years of experimenting as a proved and tested device to put inexpensively back into forest growth millions of acres of fire-killed or otherwise denuded forest lands.

Credit for the development of this five-pound tool belongs largely to John B. Woods, Jr., assistant state forester of Oregon, and three forestry department employes—Jack Hann, field man, and Joe Glath and Ben Hawkins, foreman and mechanic in the state shops.

Simplicity is the keynote of this newest gadget to come from the fertile brains of Oregon foresters. With the planting tool loaded with the seed of Douglas-fir, western hemlock, Sitka spruce, Port Orford cedar, or any other species, a man can work half a day without stopping for a refill of seeds. And, best of all, there is no more effort to operating this tool than a man would experience taking a walk through a typical forest burn while carrying a five-pound cane.

First experiment with the tool was in the winter of 1944 in the Cochran area of the Tillamook burn. Forester Woods had been traveling the length and breadth of this 300,000-acre blot on Oregon's landscape for months trying to devise some way of getting production started again in this vast area, where all seed sources had been destroyed by two severe fires. He recalled that back in 1932, M. A. McLarty, who was in charge of the Long-Bell nursery at Riderwood, had devised a rather cumbersome and complicated tool to plant alder along creek beds. This recollection started the ball rolling and, with the aid of Hann, Glath and Hawkins, the first tool was built.

Each winter since then has seen new improvements and refinements until today this bantamweight mechanism is trouble-free, with a minimum of working

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parts. A good mechanic in an ordinary shop can manufacture four of them in a day. The tool has not been patented and is available to anyone who cares to use it, and the Oregon State Forestry Department will supply detailed drawings, showing how to build one—they are that simple.

How does the tool operate? A workman, armed with a fully-loaded direct seeder, touches the sharp wedge-shaped blade to the ground, turns it in a twisting motion to loosen the soil, then grips a trigger-like handle, dropping a weighted number of seeds. He steps two paces and repeats the process. By planting on a six-by-eight-foot pattern, he can make 1,000 drops or seed spots to an acre. The percentage of germination is one seed to each five planted, but frequently as many as five seeds germinate in one spot, or drop. The touching of the tool to the ground and the gripper motion combined with the twist is almost instantaneous and barely slows down the planter in his cross-country hike.

The tool is very simply constructed. The main stem which holds the mechanism and seeds is a piece of lightweight conduit pipe one and a quarter inch in diameter. One end is split and flattened to form a blade, and a piece of saw blade is welded on to provide a cutting edge. Near the top, on one side, a small hopper with a spring is built. This is for loading the seeds. Opposite the hopper a handle of one-inch conduit extends at right angles. Inside the stem is a thrust rod with a set screw on top which controls the length of the thrust and thus the number of seeds that can be dropped each time the trigger handle is compressed. At the lower end of the thrust rod is a small cone; above it an agitator which allows the seeds to filter through in exact amount. It is roughened to keep the seeds from packing tight against the cone.

Three years of experimenting were necessary to solve the difficult problem of getting a workable piece of mechanism of simple construction to handle the infinitely small seeds of the conifer species. When one realizes the smallness of the seeds handled in the planter he gets some idea of the problem. Douglas fir seeds run 40 thousand to the pound, western hemlock, 300 thousand; western red cedar, 400 thousand; Port Orford cedar, 160 thousand; Sitka spruce, 250 thousand, and red alder 500 thousand. The tool can be adjusted to drop five or ten of these tiny seeds at a time by a simple turning of the set screw at the top of the thrust rod.

Planters under the direction of Woods and Hann have seeded

areas on exposed slopes with various types of soil conditions, as well as on covered and protected slopes. Trained planters know where to spot the seeds in natural cover, behind a log, in a clump of fern, or in bush shelter where they will have the best chance to germinate and survive after they sprout. There are now about 1,200 acres in the experimental plot, some of which have been seeded with the walking stick and some by airplane. A germination of 60 per cent of the seed spots is considered good, and on a 1,000-spot-to-the-acre pattern means a survival sufficient to rate the area well stocked. Best results, of course, are obtained on north slopes but, by using care, south slope planting can be made profitable by taking advantage of cover and terrain, fallen logs and stumps, brush and fern patches.

Leo Isaacs, well-known western forester, believes from his studies that it takes about eight pounds of seed to restock an acre under natural conditions, for birds and rodents take a heavy toll. Woods and his men are trying to economize on nature's prodigious and open-handed method of wasteful seeding. They use only a fraction of this amount, from one-eighth to one-fourth pound an acre. They reach this minimum seed need by doing three things nature can't do—cleaning the seed to insure best quality, good placing of seed drops, and rodent control, either by trapping and poisoning ahead of seeding, or by poisoning during the seeding.

What does the walking stick method of seeding cost? With labor based on present going rates, and with overhead, supervision and travel included, the average labor cost runs about $4 an acre, and this is on the high side. The probable average is $3 or lower. Cost of seed is from $4 to $6 a pound, depending on species, but a pound will seed from four to eight acres. A landowner will also want to add in the cost of eliminating rodents, which take a high toll of seeds not treated with poison.

Cost of overhead can be pretty well pegged, Woods believes, by placing crews of from five to ten men under one supervisor, and in order to insure even planting, one or more men will have to mark and flag areas being worked. If a five-man crew is used, the foreman can do all the flagging necessary. Planting should be done from November to March. Seeds planted during this period will germinate in May.

Survival on north slope plantings has been high in these experimental plots. Germination and survival of 75 per cent on south slopes has been considered good. No spot planting to fill in

where germination fails has been planned, for even with only a 60 per cent survival on 1,000 spots, an acre can produce a good stand.

Another interesting experiment conducted by Woods with the direct seeder is in what he terms "interplanting" — s e e d i n g, in areas where natural stocking is sparse, to develop, ultimately, a fine, even-aged stand of commercially valuable trees. With the tool, Woods hopes to thus improve the value of many acres.

A $6 an acre cost, capital investment to restock denuded lands, including labor, seed and rodent control, seems entirely feasible under this plan, and there is a possibility even that this figure can be reduced.

Seeding directly from airplanes costs even less, but not so much is known about the potential results. Last winter Woods seeded 600 acres in the Cochran area by plane at a total cost of $3.50 an acre. Experienced air-seeders and sprayers did the job, and built a special attachment to release a predetermined amount of seed each second as their plane flew slowly back and forth across the area. On the snow the seed distribution pattern looked even, but wind conditions must be ideal to prevent irregular spread of seed. Will the direct-seeding walking stick work? Foresters who have viewed the large experimental area say, "Yes." Intriguing as are the low cost figures compared to other methods, the survival story is even better. Woods advocates the planting tool's use over transplanting for, he says, after four or five years, trees grown from seeds will outgrow transplanted trees from nurseries because their root systems have not been disturbed.

Soybeans

Knocking the leaves off soybeans by chemical means to hasten ripening is still in the experimental stage. At the Ohio Experimental Station, l e a v e s have been completely removed in a week's time by dusting with 75-100 pounds of Aero defoliant. The germination of beans harvested from plants thus treated has not been reduced, but oil content is lowered slightly. In weedy fields there is some advantage in the fact that the chemical will kill most weed varieties.

—*Successful Farming.*

Farewell to the Haymow

Condensed from the Christian Science Monitor

Robert West Howard

THERE's a housing shortage on the farm, too. It is of just as great moment, in so far as the nation's food and fiber supplies are concerned, as the one in the villages and cities. And the farmers as they look over plans for the 5,000,000 new barns and shelters they need, stare at an architectural revolution.

The haymow has disappeared. So have the pointed eaves of the barn, the flat-roofed chicken coop and the hog pen made from odds and ends.

Tomorrow's farm buildings will curve up from the earth in functional, tooled designs. Most of them will be built from plastics or metal, instead of wood. The bins for chopped hay beside them will look like bulbous steel silos. The brood sow will have an individual penthouse that looks like a streamlined teakettle. Chicken coops will be shaped like baby airplane hangars.

The transition from "American Gothic" architecture that has typed the American farmer's work buildings for 300 years is an aftermath of the machine revolution.

Tractors, trucks, combines, quick-freeze units and hay balers, flame-throwing weed killers and milking machines have changed the economic and social habits of the 6,000,000 families who till the nation's 2,000,000,000 acres.

"The main theme for the farm buildings of the future is that they should be viewed as tools," D. Howard Doane, of St. Louis, president of the largest farm management and appraisal service in the country, said recently. "As tools they will work for the farmer and return him a profit in the same manner that a truck, tractor, or combine returns a profit. Buildings must be completely redesigned to fill the function of tools rather than mere units of storage."

Architectural consulates at land-grant colleges, officials of the big produce cooperatives, dairymen, agricultural agents of railroads, and heads of the farmers' own social organizations echo Mr. Doane's convictions.

"Historic facilities such as high-roofed barns with cupolas and fancy doors will gradually pass out of the picture along with

Reprinted from The Christian Science Monitor, Boston, Mass., Nov. 23, 1946

narrow machinery sheds," says Lewis East, General Agricultural Agent of the Pennsylvania Railroad."

In New York's dairy country, James McConnell, of the Grange League Federation, looks toward "one-story stables of concrete block or steel construction, plus fireproof silos and fireproof dry roughage storage" for future livestock buildings. From Chicago A. H. Lauterbach, General Manager of the Pure Milk Association, reports: "On my farm in southern Wisconsin there is the problem of finding a building large enough to house the necessary machinery, especially such large items as combines. We are now seriously thinking of buying one of the large Quonsets made entirely of steel. These are fireproof and will also resist storms. Because of the high cost of material and labor, farmers will drift toward the kind of buildings that will cost the least and still render the necessary service. I believe that will be steel."

This doomsday for the haymow and the rest of the architectural pattern built around the farmer's livestock has deep sociological meaning. It marks the end of America's era as a "forest people," according to the historians. For America was settled from east to west and the wagon trains trekking across the Alleghenies to the prairies and treeless western deserts took the lore and work habits of their native forest land with them.

It was the Pennsylvania Dutch, as William Penn's political refugees from the Rhineland were called, who contributed the barn pattern to America. The same pattern has echoed down through the music of our jigs, turkey trots, and barn dances, the writings of Mark Twain, John Greenleaf Whittier, and Oliver Wendell Holmes, and rears in nostalgic starkness from the paintings of Grant Wood, John Steuart Curry, and Lauren Ford.

The Pennsylvania bank barn was, and is, 80 feet long and 50 feet high, compactly designed as a crop factory for a horse-powered economy. The ground floor was built into a side hill whereever possible in order to provide natural insulatioin, and contained individual stalls for cattle, horses, and hogs. The driveway, big enough to hold a team of horses and a load of hay, centered the second floor with mows and granaries on either side. This driveway became an indoor threshing floor in late fall and winter. There were trap doors and chutes leading down to the livestock stalls, and there were ventilating systems made from earthenware chimney pots. Manure and litter were collected in one corner of the enclosed yards to "mulch" before being spread on the fields.

At the other end of the yard stood stacks of hay and straw, each with a wooden roof.

It was the bank-barn pattern that spread north from Philadelphia, York and Lancaster during the eighteenth century and was carried, with regional adaptations, into the great plains and the western mountains during the nineteenth century. With it went the whole wood saga of barn-raisings, barn dances, red paint, peaked roofs, imaginative carvings, and even hickory ax handles.

Today the advent of technology in agriculture, heralded by the development of the tractor 25 years ago, augurs a totally new life for the countryman. The arrival of the machine, together with electricity, radio and, perhaps, atomic energy, gives rural America the potentials for the only American art form, architecture, and social change of the twentieth century.

At Iowa State College, near Ames, and at the University of Wisconsin, in Madison, experiments in steel and fabricated housing have been under way for the past five years. In Paris, Kentucky, a steel manufacturer has purchased his own farm in order to work out basic problems in the development of steel barns, cribs, silos. Here ultra-modern steel dairy barns stand next to a steel hay-keeper in which stored hay, containing as much as 40 per cent moisture, can be cured by forced ventilation. Prefabricated steel sheet panels are being used in other structures, not only for inside walls and ceilings but for surfacing stock rooms and grain bins.

Similar experiments are under way with other light metals, with plastics, with fireproofed wood.

So the heralds of change cast their shadows across the barnyard from Maine to California. The haymow is out. The face of the land is changing.

Cashing In On Weeds

Condensed from The Montana Farmer

Don R. Bosley

How was your weed crop this year? Good? That's not bad, for weed seeds this fall have a cash value equal, pound for pound, to approximately two-thirds that of wheat at the present market prices.

One vegetable oil processing plant in the state is paying an average of 2 cents a pound for all oil-bearing weed seed it can get. And this being a bumper crop year for weeds, it is getting plenty. Trucks are standing in line daily to unload. All the plant's storage facilities are filled and cars are standing on the tracks. And it's all weed seed.

To date the plant has processed approximately 3,000,000 pounds of such seed, about 1,500,000 pounds during the single month of August. At the rate the seed is coming in, the plant expects to treat up to 10,000,000 pounds during the season.

Since the oil extraction averages 25 per cent, this means that approximately 300,000 gallons of oil and 3,750 tons of feed concentrate may be produced this year in Montana — all from weeds. With the shortages of both oils and feeds as acute as they are in the nation, this incidental production from otherwise waste material looms up significantly.

The weed seed oil, while admittedly not quite as good as linseed oils, makes a suitable substitute that may be used for practically all purposes for which linseed oil is used. The process is the same as that for other oil-bearing seeds, and as the weed seed oil gushes from the presses and filters, it appears as beautifully clear and amber as the best standard oils.

The value of the weed-seed oil is unquestioned. Chemical analysis shows that the meal contains high percentages of protein and ether extract, and feeding tests proved the meal to be slightly superior in value to the same amount of soybean meals. If fed to dairy cattle after milking, it will not affect the taste of the milk.

Since the weed-seed meal cannot be fed straight, but is best as the component of a mixed feed, the entire production of the oil plant is being marketed to commercial feed producers.

So far most of the plant's run has been of screenings consisting

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of about 75 per cent Jim Hill mustard and 25 per cent rabbit ear mustard, with some fanweed. Any seed that is oil bearing can be processed, however. Operators who may be in doubt as to the oil value of screenings should send in samples for tests before going to the trouble or expense of hauling or shipping.

This new development of a cash market for weed seed comes under the heading of pure velvet. It is comparable in a sense to the miner's realizing extra profit from the baser metals in his ore, but it also has something of the glamour of winning the gate prize at the country fair. We'll refrain from suggesting that it's like striking oil.

Processing 10,000,000 pounds of weed seed will add about $200,000 to the state farm income. That leaves weed seed as a cash crop, still in the category of "chicken feed," but it's not bad for side money. Then there are the oil and the seed meal which are added to the state economy. These things are all on the plus side of the ledger.

But it goes back of that. Weed seed has formerly been a definite expense and hazard—dockage. This dockage cut seriously into the value of the harvest and forever posed to the producer the problem of which would be the cheaper, to screen out the weeds from the grain or let it go and pay the extra freight on it to market. Either way there was no chance of escaping an expense.

Besides, there's the sheer mechanical advantage of taking 10,000,000 pounds of weed seeds forever out of circulation. Admittedly there are many more millions of pounds left in the fields to assure another big crop of weeds next year, but the thought of how many acres 10,000,000 pounds could seed to a good stand is staggering.

Naturally the present comparatively high price for weed seed is only temporary, since it is due to the abnormal shortages of oils and feeds. It was timely, however, that this should be one of the first years that weeds should come to have a commercial value. It was an unusually good, or bad, year for weeds, however one prefers to look at it. Weather conditions were such this spring that even many thoroughly tilled fields were so choked with weeds that wheat and other crops, further set back by late frosts, were seriously threatened. Only favorable weather during the later growing and filling season saved the crops.

Though in most cases farmers were able to operate their combines or binders high enough to avoid most of the weeds, dockages reportedly ran from 4 per cent to as high as 20 per cent. C. J. Konesky, of Stockett, one

of the several hundred farmers who have trucked their weed seed screenings to the plant, estimated that about 10 per cent of his combine run was weeds. Like many other operators, he had equipped his combine with a screen to separate the weeds from the grain. Thus he salvaged his extra dividends at no extra expense or effort. Others who found their harvest running to equally high or higher percentages of weeds have held the grain until they could run it through a fanning mill.

The farmer still must make every effort to control weeds, but hereafter, when the weather gangs up with the weeds against him, he can derive some satisfaction from the knowledge that the pests competing with his crops for precious moisture and nutrients from the soil will themselves have some salvage value.

It appears that the farmers' age-old war with weeds is well on the way to being won. To the continuance of good tillage practice can now be added the new weapon of the selective chemicals, which are showing much promise in the eradication of weeds. And now, with weeds having a cash value, the farmer will still strive to kill all the weeds he can, but what he can't kill, he can sell.

Beef Buildings

About 10 per cent of the cost of producing beef can be charged to farm structures and equipment, according to the North Central Committee on Housing of Beef Cattle and Sheep. This study is from the contributions made by 14 North Central states. Authorities are animal husbandmen and agricultural engineers.

Full information may be obtained in Regional Bulletin No. 6 from your own state agricultural college. It contains drawings of various beef cattle barns and sheds. It also presents a full program of planning to fit the buildings to the practices of the farm.

Film Wrapped Corn Stays Fresh

Condensed from Florida Grower

CORN on the cob with all of its food freshness from ten days to two weeks after it has been picked is now a possibility, according to feed packaging experts in the laboratories of The Goodyear Tire and Rubber company.

This control of freshness is made possible, it is claimed by packaging the corn in a transparent, moisture - water - vapor-proof material, already being used in the preservation of scores of fresh, frozen, and dehydrated foodstuffs.

Corn offered under normal marketing conditions is considered highly perishable, its shelf life limited to about four days when unhusked and kept at normal store temperature. This life can be increased to a week if refrigeration is used.

Drs. M. D. Coulter and P. J. Vaughan, of the food research staff, say that tests made in Akron and at the agricultural experiment station of the University of Florida showed Pliofilm-wrapped Golden Bantam corn kept in excellent condition at 37 degrees over a fourteen-day period with a weight loss of only 6.72 per cent, and could be still considered marketable under the same conditions at the end of twenty-three days, when the weight loss was only 1.44 per cent.

This is in contrast to unhusked corn at 37 degrees, which was unmarketable in seven days with a weight loss of 8.41 per cent. At the end of a two-week period it showed a weight loss of 13.2 per cent and at the end of a 23-day control a weight loss of 22.3 per cent.

Recognizing the fact that corn is not usually kept in a refrigerated condition, tests at 70 degrees were also made; this being an approximate store temperature. Wrapped corn showed a weight loss of only 2.4 per cent while unhusked corn lost 27.2 per cent over a ten-day period.

Corn wrapped by a high-speed operation showed an average loss of 0.5 per cent when stored for ten days in a domestic refrigerator in a dry atmosphere. Unhusked corn was unusable after the third day.

Food packaging specialists foresee distinct advantages in their method of handling this delicacy. High-speed wrapping machines are now being developed which can be moved right to the fields where husks can be removed, the corn pre-cooled and sealed within

Reprinted by permission from the Florida Grower, Tampa, Florida, Nov., 1946

its new transparent wrapper almost immediately.

This method, according to the scientists, will return to the soil a great many elements found in the usually home-removed husks. It will eliminate the need for paying freight on the useless husks, will allow growers to maintain a quality product, to trademark their crop, and will permit the buyer to examine the product in a sanitary, airtight package. It will also eliminate the practice of customers partially husking each ear in the market, which only hastens the already rapid dehydration process.

The method also will make possible the long-distance shipping of corn, opening up northern markets during the southern corn season, and vice versa. Present crops are confined to local markets only.

Another advantage to the consumer packaging of corn, according to Dr. Coulter, is in table preparation. The wrapped corn may be dropped into boiling water and the entire cooking operation performed without breaking the sealed Pliofilm wrapper until the corn is ready to serve. Being odorless and tasteless, the wrapper holds all the food elements and succulence, partially extracted from the kernels by the boiling water. It may be kept, too, in the ice box for days after cooking, and still retain its original cooked freshness.

Selecting Your Herd Sire

Condensed from Hoard's Dairyman

Russell E. Horwood

Michigan State College

Dairy farming is a business. Financial income is its basic purpose for the dairyman. There are two major sources for this income, namely the sale of dairy products and the sale of cattle for production and breeding purposes. The success of the individual herd owner depends to a considerable extent on his ability to select sires which will transmit the essential characteristics such as high production, desirable type, and long life to his offspring.

A dairyman selects several bulls in his lifetime and dairymen throughout the country select thousands annually. The number selected by individuals is being reduced somewhat by the development of artificial insemination associations.

With present information it is impossible to outline a method of selecting a sire that gives positive assurance of success. However, there are factors which, if followed, will eliminate much of the chance of failure.

In selecting the dairy sire, attention should be given to three factors: (I) progeny, (II) pedigree, (III) type.

I. Progeny

1. *Production*—The progeny is the best guide as to what a sire will transmit in the way of type and production. The offspring must be carefully studied and certain obstacles in his use recognized. A study of sires proved in dairy herd improvement associations shows that approximately two-thirds increased or maintained production and one-third decreased production. The differences found between proved bulls are indicated in Tables 1, 2, and 3. The data were taken from United States Department of Agriculture Miscellaneous Publication 574.

Table 1 shows the proof of Sire A. There are 15 daughters with 16 lactation records. Only 14 daughters, however, have dams with records. The figures, 6-7-8 indicate that six daughters exceeded their dams in milk production, eight exceeded their dams in per cent fat, and seven

Reprinted by permission from Hoard's Dairyman, Ft. Atkinson, Wisc., Nov. 25, 1946

Table 1. Sire A—A Bull Proved Highly Creditable

		Lbs. Milk	Test %	Lbs. Fat
15 daughters	16 records	16,685	3.5	590
14 daughters	15 records	17,000	3.5	601
14 dams	39 records	14,907	3.4	504
Diff. (6-8-7)		+2,093	+.1	+97

in pounds of butterfat. It may be seen by the performance of his daughters that he has transmitted high production to them. Even though their dams were high producers, the mating of this bull with them gave his daughters the ability to produce 2,093 pounds more milk and 97 pounds more butterfat per year, and raised their average test 0.1 per cent.

The bull in Table 2 is also proved. He was bred to only fair producing cows and the daughters actually produced 1,107 pounds less milk and 56 pounds less butterfat than their dams. The daughters' production indicates that this bull does not have ability to transmit even a fair level of production to his progeny. It may be noted that four of the daughters exceeded their dams in milk, one in percentage of butterfat, and four in pounds of butterfat. He has *proved* to be undesirable even in a low producing herd. *This shows that the term PROVED SIRE is not necessarily a term indicating merit.* It means only that he has five or more unselected daughters with records which may be compared with the records of their dams.

Table 2. Sire B—A Bull Proved Undesirable

		Lbs. Milk	Test %	Lbs. Fat
14 daughters	20 records	7,988	3.3	260
11 daughters	16 records	7,904	3.2	254
11 dams	31 records	9,011	3.4	310
Diff. (4-1-4)		—1,107	—.2	—56

Table 3 presents the information on the proved Sire C. The production records of his daughters are slightly below the records of their dams. He was bred to dams of fairly high production, and his daughters did not quite maintain that average. However, had he been bred to the dams in Table 2, he would likely have increased the production of their daughters.

Had he been bred to the dams in Table 1, it is also quite evident the daughters would have produced less than their dams. A variation, however, of less than 25 lbs. fat by the daughters from their dams probably has very little significance.

It is well to remember that, on the average, one-half of the inheritance of the offspring of a bull comes from his sire and one-half comes from his dam. Thus, the record of a proved sire may be used to indicate the level of production he is likely to transmit. Even so, however, the production of daughters of a bull proved in one herd may not always follow the same pattern in another herd.

2. *Factors Affecting Proof of Sires*—Several factors are listed that may affect the proof of sires. These factors should be checked carefully in evaluating the transmitting abilities of such bulls.

a. Generally the greater the number of daughter-dam comparisons the more accurately the records indicate the level of transmitting ability of the sire.

b. A check should be made to determine that all tested daughters from tested dams are included.

c. Likewise it is generally considered that the larger the number of records on each daughter and dam the more accurate the interpretation will be.

d. The percentage of butterfat should not vary widely from the breed average.

e. The feeding and herd management under which the records of both the dams and daughters are made as well as the number of milkings per day, age at freshening and the length of the record have a definite bearing on the level of production.

f. The age or maturity of both daughters and dams when tested

Table 3. Sire C—A Bull with Questionable Proof That Needs Careful Analysis

		Lbs. Milk	Test %	Lbs. Fat
8 daughters	9 records	10,772	3.5	377
8 dams	27 records	11,514	3.4	390
Diff. (3-5-4)		—742	+.1	—13

may have a bearing on the accuracy of the proof.

g. The length of the interval between calves and the age of freshening for the daughters or for their dams, if abnormal, may result in a proof that is unduly favorable or unfavorable to the sire.

In case two bulls are approximately equal the one with the more desirable pedigree should be selected.

3. *Factors Other Than Production*—It is important to study the type of the progeny of a proved bull and make comparisons with the type of their dams. The size, shape, attachment, and quality of udders, the size of the animals, their ruggedness, strength of legs, and general conformity to breed type will have a bearing on the length of productive life of the animals.

In addition, consideration should be given to disease, breeding efficiency, age, price, disposition, and facilities available for handling a bull of this age.

4. *Selecting Bulls with a Common Ancestry*—More uniformity in type and production may be expected where a succession of bulls are used with some common ancestry in the first three generations of their pedigrees. In this manner the characteristics common to the ancestry will be intensified. This will be equally true for both desirable and undesirable characteristics. Faster progress may be made using this plan if great care is exercised in selecting bulls with ancestry that are free from serious defects. This is also true in selecting unproved bulls.

5. *Desirable Proved Sires Scarce*—A total of 1,886 bulls were proven in dairy herd improvement associations during 1944. In addition a number were proved in the breed herd test programs. Many of these were dead or infertile when proved. Others sired low production or other undesirable characteristics. Thus dairy men are faced with the fact that there are only a very limited number of desirable proved bulls available. The use of such bulls has been limited by the price, the age, health, danger, lack of facilities for housing, lower fertility, and uncertainty for further breeding purposes. The services of some of the better proved bulls are being extended by artificial breeding. However, according to the Bureau of Dairy Industry, only 23 per cent of the bulls used in cooperative artificial breeding associations throughout the country are proved. This leaves thousands of herds that must secure their inheritance from unproved bulls.

6. *Partially Proved Bulls*—In many cases bulls may be found which do not have a sufficient number of daughters with records

to be proved, or which have daughters out of untested dams. These sires may have equal or superior inheritance and transmitting ability to that of available proved sires, but such evidence is not yet complete. Because a bull is not entirely proved is no reason to eliminate him from consideration as a possible herd sire.

Should a partially proved bull be found that has demonstrated to a degree that he is transmitting the desired inheritance for type and production, his use will give more assurance of success than would the use of a young untried sire.

II. The Pedigree

1. *Selecting the Unproved Bull* —Galton's law states that one-half of the inheritance of an animal comes from the sire and dam that make up the first generation, one-quarter from the grandsires and granddams in the second, and one-eighth from the great-grandsires and great-granddams that make up the third generation. This accounts for 87.5 per cent of the total inheritance. This law further indicates that each animal in the first generation is responsible for 25 per cent or one-fourth of the inheritance of its offspring, in the second 6¼ per cent or one-sixteenth, and in the third generation 1½ per cent or one-sixty-fourth. Thus, in general each animal in a pedigree may be considered to have equal transmitting ability to its immediate offspring; however, this influence becomes decreasingly less in more distant generations. In most cases it is not necessary to give serious consideration to animals beyond the third generation, or the great-grandparents in the pedigree.

The pedigree of a prospective sire should contain the information by which his inheritance may be evaluated. The manner in which the information is presented will vary somewhat with the breed.

2. *Pure and Mixed Inheritance* —Most animals transmit desirable characters to a certain percentage of their offspring. In some instances, desirable characteristics may be transmitted to a high degree; in others, moderate, and in still others, to only a very limited extent. Animals that uniformly transmit to their offspring a character or group of characters, as large size, firmly attached udders, or high butterfat test, are said to be homozygous or approaching purity in their inheritance for that character or group of characters. An animal likewise may be pure in its inheritance for undesirable characters.

On the other hand, the animals that transmit a character group of characters to only a limited extent are spoken of as heterozygous or mixed in their inheritance.

The offspring from heterozygous animals will lack the uniformity of production and type that is essential to improve the herd, although certain individual offspring may be most outstanding. It cannot be generally expected that these outstanding animals will transmit their type and production to their offspring. Thus the production or type of such animals is of little value in indicating what their offspring will be like. This is the kind of a cow that one frequently gets for the dam of his bull when selection is made entirely on the production record of the dam. It usually leads to disappointment.

It is important in selecting an unproved bull to study his ancestors to determine his likelihood of transmitting the desired characters uniformly to his offspring or within a narrow range. This can be determined much more accurately from the performance of the progeny of the animals in the pedigree than from the type and production of the animals themselves. A minimum of five unselected daughters of a sire with type and production records from dams with similar information or 10 unselected daughters with type and production records will furnish the basis for evaluating the transmitting ability of a sire for production and type. The transmitting ability of a dam in the pedigree is more difficult to evaluate than a sire, because of the limited number of her offspring. The production and type rating on one or more of her daughters will be helpful. In a similar manner the production and type data on her sons' female offspring will furnish valuable information. Likewise a combination of daughters and sons with daughters would be equally valuable.

3. *Son of Proved Sire*—In accordance with the principles outlined, it is advisable when selecting an unproved bull to select the son of a sire proved desirable. In this case, records on the daughters of the sire of the bull selected are given the most consideration. Although it may not always be true, it may be assumed that the level of production a young bull genetically carries is within the production range of his half sisters.

Table 4 illustrates the need for considering records of more than one daughter of a bull. In fact, it is important to consider the range and the level of production and type for all the daughters. In this table there are two sets of five half sisters shown with their butterfat production. In each case four show uniform production, while one does not. Number 3, daughter of Sire A, has a much higher record than her half sisters, while Number 4, of Sire B, is much lower than her half sisters.

Table 4. Production Records of Daughters of Two Sires*

Daughters of Sire A	Butterfat Production	Daughters of Sire B	Butterfat Production
1	275 pounds	1	408 pounds
2	305 pounds	2	425 pounds
3	450 pounds	3	415 pounds
4	301 pounds	4	300 pounds
5	290 pounds	5	450 pounds
Ave.	324 pounds	Ave.	399 pounds

*Mature equivalent records.

The individual records of these two daughters are not so important as the average of all the records of the half sisters. Their individual records merely indicate their ability to produce, while they probably have about the same genetic makeup as their half sisters. The variation that does exist in their inheritance comes partially from the dams. It is likely that they would transmit to their offspring a level of production similar to the average of their half sisters. A bull selected from Number 4 daughter of Sire B would likely transmit higher production to his offspring than a bull selected from the Number 3 daughter of Sire A. Likewise a bull sired by A or B would inherit from his sire approximately the average production of his half sisters. *This indicates the importance of studying complete progeny records.*

III. The Type

The type or appearance of a cow is not a true indication of her production. The type classification of cows of the several breeds does indicate in general that those classifying in the upper percentages are the higher producers. It seems reasonable to expect that even a greater correlation might be observed in lifetime production. Such a correlation was not indicated when the type sire was compared with the production of his offspring. This would indicate that the type of a prospective sire would alone be of little value in selecting a sire. When sires are selected only on their individual type they are likely to lead to disappointment. In selecting a herd sire a common error is often made by over emphasizing the type of the animal.

The statement is often made that a herd of scrub cows does not warrant the use of a purebred bull from production-tested ancestors. Such a statement can be challenged. Scrub herds or herds of low inheritance for production can expect the greatest improvement provided a sire, well selected for production and type, is used. The dairyman with a herd that will average 350 or more pounds fat may have much more difficulty maintaining that level of production than the one with a 200-lb. fat herd average will

have in increasing it with the help of well selected bulls.

The average production of cows in the United States is approximately 190 lbs. fat per year. Thus, approximately one-half of the cows are producing less than this. Unless cows are tested, there is no accurate way of telling which ones fall below the average and which ones produce more than the average. Buying a scrub bull or one from untested ancestors is like reaching blindfolded into a grab bag for a prize.

Since production is the key factor in determining whether a cow returns a profit, it is highly important that a dairyman use a herd sire that shows every indication of having the ability to transmit production that is higher than the herd he is to be used in for herds below a 350-pound butterfat average and, at least, to maintain this production in herds above that level. For reasonable assurance of success, the factors that are desired in the herd should be found to predominate in the first three generations of the sire that is selected.

"It doth not require a great deal of the Spirit of Prophecy to say that as long as the world lasts, the Pleasures and Entertainments which Gardening and Agriculture afford will be the pursuit of wise men."

JOHN LAWRENCE

A NEW SYSTEM OF AGRICULTURE
1726

Permanent Fencing for the Farm

Condensed from The Progressive Farmer

Prof. R. H. Driftmier

Farm Buildings Editor

FARMERS have been building fence for so long that it is considered a very ordinary job—sort of a rainy-day job—something to do when you can't work in the field. Yet when one considers the investment in fences, perhaps their selection and construction should rank in importance along with other farm enterprises. It has been estimated that the farmers of America spend about 50 million dollars annually for fence products and for labor in repairing and constructing fences.

If the farm fence is to serve its purpose—to protect livestock and crops and add to the general appearance of the farm—a discussion of construction methods may be helpful. In selecting a fence three main factors should be considered:

1. Service. Is the fence adaptable to the purpose intended, and will it turn livestock without injury?

2. Economy. Reasonable first cost, low depreciation, ease of maintenance, and occupation of a minimum amount of land are important.

3. Appearance. Are materials attractive, workmanship good, and fence rows easily cleared?

The two most important types of farm fences are barbed wire and woven wire. Barbed wire strands are 12 and 12½ with a 14 gauge wire for the barbs. Barbed wire is made with both two and four point barbs. The two point barbs are usually spaced 3 inches apart for hogs and 5 inches apart for cattle, while the four point barb is commonly spaced 5 inches apart for hogs and 6 inches for cattle. Woven wire is made in many patterns — usually rectangular or diamond mesh for field fences and more elaborate patterns for paddocks, lawns, and wardens. Woven wire is sold by number, the standard numbers being 1155, 1047, 939, 832, and 726. The first one or two numbers refer to the number of line wires and the last two numbers to the height of the fence. Thus 1047 describes a fence 47 inches high with 10 line

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wires, and 726 refers to a 26-inch fence with seven line wires. Vertical stay wires are usually spaced 6 to 12 inches apart. Woven wire for livestock will run from No. 9 to 14½ for the line wires, whereas for poultry 13 and 14½ gauge wires with 6-inch spacing of stays is satisfactory.

Heavy poultry fencing may be obtained in heights of 36 to 72 inches, increasing by 12-inch increments, poultry netting in heights of 12 to 72 inches by 6-inch increases. Heavy breeds require a fence about 60 inches high; 72 inches is better for the lighter breeds.

For pasture and field fences the requirements will vary depending on the protection desired and the kind of livestock fenced in (or out). Where horses, cattle, sheep, and hogs are in the same pasture a 26-inch woven wire with three barbed wires above or a 32-inch fence with two barbed wires above is satisfactory. For cattle alone three-strands of barbed wire are ordinarily used. However, any one of the following three combinations makes an exceptionally good, though more expensive, fence: 39-inch woven wire with 2 barbed wires above, 47- or 55-inch woven wire with one strand of barbed wire above.

To protect gardens, orchards, and nurseries from rabbits and other rodents a 1½-inch netting about 36 inches high may be used.

The three kinds of material most commonly used for fence posts are wood, metal, and concrete. Osage orange or hedge, black locust, red cedar, lightwood, chestnut, and catalpa are the most durable wood posts, with an average life from 15 to 30 years. White oak, cypress, mulberry, sassafras, black walnut, tamarisk, cherry, hackberry, bur oak, hemlock, white walnut will last about 8 to 16 years. The elm, larch, honey-locust, sap pine, willow, ash, birch, cottonwood, aspen, maple, hickory and persimmon will last from three to six years untreated.

There is a rather wide range of materials available for treating fence posts. The cost will range from a few cents per post to as high as 15 or 20 cents. In the South it is advisable to treat the entire post. The open tank creosote method is widely used. The preservative is heated to a temperature just below the boiling point and the post is left in the heated preservative for from 1 to 2½ or 3 hours.

A number of newer methods of treating fence posts to add to their life have been developed in recent years. Chemicals such as pentachlor-phenol dissolved in fuel oil or kerosene or crankcase oil may be used to treat well seasoned peeled posts. Zinc chloride

or chromated zinc chloride is an easy chemical for farm use and posts do not have to be peeled. Borax seems to offer the lowest cost treatment of all, but the method is still in the experimental stage. An old method but one that still holds possibilities with young pines is to partially skin them and treat with their own resin.

The size of wood post to use depends largely on the species of wood. Osage orange or hedge posts as small as 2½ inches are used. Usually, however, line posts run from 4 to 6 inches and corner posts from 8 to 12 inches. Line posts are usually set in the ground 30 inches and extend about 6 inches above the fence. This will require a post with an over-all length of 7 to 8 feet for line posts. Under ordinary conditions line posts are set one rod apart. In some cases the regular line posts are spaced about 50 feet apart and two intermediate stays located at the third points of the span are used.

Metal posts may be obtained in a variety of shapes, either painted or galvanized. Metal posts have the advantage of being light in weight, are easily handled and can be readily driven into most soils. In addition, they provide a ground for lightning and are resistant to fire. A good 7-foot metal line post will weigh between 8½ and 10 pounds.

Concrete posts, if properly made and reinforced, will give many years of useful life. For a 7-foot concrete post with 3x4-inch tip and 5x4-inch bottom, forty ¼-inch rods 6 feet 9 inches long, 3 sacks of cement, and 8½ cubic feet of sand are required for 10 posts using a 1 part cement to 3 parts sand mix. Line posts are precast in home or commercially made forms; end and gate posts are cast in place.

Staples should be 1 inch long for hardwood posts and 1¼ inches long for softwood posts. Staples should be driven diagonally with the grain of the wood, to prevent splitting. Do not drive staple "all the way home." Fences supported by wood posts should be grounded every 8 or 9 rods.

Plan Ahead for a Profitable Pig Crop

Condensed from The Larro Feeder

H. Ernest Bechtel, Ph.D

Director of Research, Larro Research Farm

PORK production costs depend more on the size and quality of the pig crop than on any other single factor. Large litters are the first requisite. Then come good mothering, plus all the other factors that make for high livability and good weaning weight. These goals can be reached only by planning ahead, and by doing the right things in the right way at the right time.

Poor pig crops in a good many cases really start with the inheritance of the sows and the boar. Prolific animals don't just happen. They are more or less born that way. Unfortunately, however, a good many strains of our popular breeds of hogs seem to farrow small litters or else wean a bunch of poor pigs.

Work with inbred lines by the Regional Bankhead-Jones Swine Breeding Laboratory shows very clearly that undesirable characteristics can be weeded out and the good points intensified by a sound breeding and selection program. Good breeding is the foundation of success in this respect, and the best hog producer will be the one first of all who improves the inheritance of his stock.

Boar selection should be based in so far as possible on the factors of prolificacy, pig livability, pig growth, and market quality of the finished hogs. A boar that can improve these factors in the next generation of pigs will pave the way for a sound pork producing enterprise. Thus, it is highly important that good judgment be used in selecting the boar and in selecting his get for the breeding herd.

In spite of its basic importance, breeding is said to account for only about one-fifth of the end result in hog production. The other four-fifths are controlled by environment, of which feeding is a major part.

Pregnant gilts and sows have need of certain nutrients for maintenance, for their own body growth, and for the development of the unborn pigs. They also need certain nutrients to build the firm fleshing that prepares them for the nursing job after farrowing. Proper conditioning of the animal during pregnancy is essen-

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tial because of its bearing on her nursing performance after farrowing. Feeding after farrowing is equally important since actually the pigs are fed through the sow at first because proper feeding of the sow enables her in turn to do a better job of producing milk for her pigs.

It is usually considered best to limit the feed for pregnant sows and gilts in order to build the desired degree of body condition without their becoming too fat. Many experienced swine herdsmen feel that overfat sows are inclined to be irregular breeders and to have more difficulty at farrowing time—moreover, such sows usually are clumsy and they are apt to be poor mothers.

Yearling sows should receive about 1½ to 2 lbs. of feed per 100 lbs. of body weight, or a total of at least 6 lbs. daily for a 400 lb. pregnant sow. Older sows should require not more than about 1½ lbs. of feed per 100 lbs. of body weight, or not quite 7 lbs. total daily for a 450 lb. sow. If pasture is not available, each sow should also receive the equivalent of about ½ lb. of sun-cured alfalfa hay or meal each day.

When signs of farrowing are seen, reduce the total feed intake gradually to no more than 2 lbs. daily per animal on the day of farrowing, but continue the alfalfa.

On the day after farrowing Then increase ½ lb. daily until 10 lbs. is reached. Thereafter, the feed can be raised ½ lb. every other day until the sow is on full feed. Full feed will vary some, depending on the size and condition of the sow and on the number of pigs in her litter. Generally, a day's food for a nursing sow will include 4 to 6 lbs. for the sow herself, plus 1 lb. for each pig in the litter—in addition to pasture, or to a daily feed of about ½ lb. of alfalfa per sow.

At Larro Research Farm the aim is to wean all pigs at 56 days of age. On the day of weaning, each sow gets only 2 lbs. of feed, in addition to ½ lb. of legume hay. This rate is increased, starting 4 days later, by ½ lb. daily per sow until back on an intake of about 1½ to 2 lbs. daily per 100 lbs. body weight, in addition to ½ lb. of sun-cured alfalfa hay. The usual practice is to turn the sows into the boar lot on the first day after weaning since estrum normally occurs within the following 3 to 10 days.

Weaning boars or gilts, retained as potential breeders, can be fed either of the above feeds on a free choice basis until a body weight of about 300 lbs. is reached. Then the amount can be increased or decreased as needed in order to avoid an excessively fat animal. The daily ration should also include about ½ lb. of sun-cured alfalfa.

Abundant supplies of fresh, clean drinking water should be available at all times to pigs of all ages.

The quiet attendance of the herdsman is desirable at farrowing time. He can help the new born pigs escape from the placental membranes. He can also see that the pigs start breathing promptly, and that they nurse the sow without delay.

Lacerations of the sow's udder, and of the pigs' lips and gums, can be avoided by using pliers to pull out the wolf teeth in the young pigs. These are known also as needles or canine teeth.

A pig brooder should be used in one corner of each farrowing pen if and when warranted by cool pen temperatures. At Larro Research Farm, a 250-watt infrared lamp is used for this purpose as needed during the first 4 to 6 weeks after farrowing. Some people find a 100-watt bulb adequate in the pig brooder by locating the bulb somewhat nearer the pigs.

For the first several days after farrowing, it may be helpful to tip the floor near the brooder so that the floor slopes down toward the brooder. A satisfactory slope is about 1 to 1½ inches to the foot. If not obtainable in any other way, individual portable farrowing houses can be tilted by placing a couple of cement blocks or a piece of wood under one side of the house. Tilting the floor in this manner encourages the sow to lie with her back up hill. This makes it easier for the young pigs to work back and forth from the sow's udder to the brooder provided the floor slopes down toward the brooder. As a result the new born pigs are less apt to get chilled or hurt by straying from the brooder during the first week after birth. This floor arrangement reduces losses, due to mashing by the sow, from about 1 pig out of 5 to only 1 pig mashed out of 30.

All farrowing pens should be equipped with guard rails. These are attached to the exposed walls about 10 to 12 inches above the floor and extend out about a foot. These help to keep the sow from lying on her pigs. Guard rails have saved many a pig that otherwise would have been crushed beneath the sow.

Milk from the sow is virtually the only source of nutrients for new born pigs. This milk is deficient in certain elements needed for blood building in the body. And, feeding these elements to the sow will not enhance the value of her milk. As a result, young pigs are apt to develop anemia or thumps after they are a few weeks old—especially if raised on concrete floors without coming in contact with any earth.

To protect against anemia, a

7½-inch paint brush is used to paint each sow's udder twice daily at nursing time with an iron and copper mixture. This mixture is made by adding 6 parts ferrous sulphate to each 1 part by weight of copper sulphate. Then, 2½ ounces or 8 rounded teaspoonfuls of this mineral mixture are dissolved in a minimum amount of water in a pint jar. The jar is filled with molasses and the mixture used in painting the sow's udder. The pigs like the molasses-mineral mix and consume ample amounts of iron and copper to prevent anemia until they are old enough to get their minerals by eating grain. By following this method, sows and their litters are kept in strict confinement up to weaning time in their experimental pens at Larro Research Farm with excellent results.

After 5 weeks of age, the pigs will normally be eating enough grain so that they will not need iron and copper in molasses to maintain healthy bodies.

As soon as the nursing pigs are 2 weeks old, creep feeding should start. This is done by placing some of the same feed used for the sow in a small feeder to be used only by the little pigs. This feeder is placed inside an enclosure so constructed that the little pigs can enter between upright slats or bars. But the uprights are placed close enough together to keep the sow from disturbing the pigs while eating.

Replenish feed in the creep daily to prevent accumulation of spoiled, eaten-over feed. Ample room should be provided in the creep and plenty of water should be available to the little pigs at all times. This water availability is very important because it promotes greater feed intake, and therefore faster growth.

Creep feeding supplements the sow's daily milk, keeps sows in better condition because they don't milk down as rapidly, produces thriftier, growthier pigs and helps the smaller pigs get off to a better start. Creep fed litters develop more uniformly and wean easier because they have become accustomed to eating dry feed.

Hog Cholera is common in the United States and vaccination of young pigs should be done regularly in order to protect all lots against infection.

One method of preventing cholera is by the so-called simultaneous inoculation method. This calls for the injection of serum and of virus into pigs usually about 4 to 8 weeks of age. Because the dosage increases with the weight of the animal, it is more economical to immunize pigs in this manner against cholera when they are small rather than after weaning. The serum is prepared commercially by inject-

ing virulent blood from a cholera-sick animal into an immune hog; this highly immunized hog then supplies blood from which is obtained serum rich in antibodies which can produce temporary immunity lasting over a period of a few weeks. This serum is given simultaneously in conjunction with a small amount of fresh virulent blood (containing virus) so that the treated pig produces additional antibodies in its own body in order to resist cholera; the immunity produced by these additional antibodies usually persists throughout the life of the animal. The permanence of this immunity is a distinct advantage, but some swine breeders dislike the serum-virus treatment because it may involve bringing the virulent agent, which causes cholera, on premises where cholera did not exist previously. Moreover, this simultaneous serum-virus treatment may set back the pigs temporarily and this may lead to complications and even to some losses. However, in the case of garbage-fed herds, where cholera risks are much increased, the serum-virus method is generally considered to be by far the most satisfactory treatment available.

An increasingly popular method of immunizing hogs, against cholera, is crystal-violet vaccination. This vaccine, when applied to 4 to 8 week old pigs, produces an immunity which lasts to marketing age at least (at about 6 months) and it produces none of the serious ill effects of the serum-virus treatment. The vaccine is produced commercially by incubating a mixture of virus and crystal-violet (an aniline dye), which eliminates the disease-producing property of the virus without destroying its immunizing quality. This method produces immunity within about 2 to 3 weeks after vaccination, and is less expensive and safer in many instances than the serum-virus method—especially in producing market hogs for slaughter. The size of the recommended dosage per pig is the same regardless of the age or size of the animal. Where added protection from cholera is desired, a second injection of crystal-violet vaccine sometimes is given a week or two after weaning.

B.T.V. (Boynton's Tissue Vaccine) is another preparation, which, like crystal-violet vaccine, can be used without danger of reseeding the cholera infection and without causing a systemic reaction and vaccination stunting. B.T.V. is made commercially by treating finely ground glandular tissues of cholera-sick pigs with eucalyptol (a colorless, camphor-like, oily liquid) to destroy the disease producing properties of the tissues without destroying its immunizing or anti-

genic properties. Healthy pigs treated with B.T.V. are, within about 3 weeks, immunized against hog cholera up to market age. Two injections are given—one before weaning and one after weaning, as a common procedure. Breeding stock previously immunized with M.T.V. should be given one additional vaccine injection at least once yearly.

At Larro Research Farm, 5 to 6 week old pigs are given a flank injection of B. T. V. A second treatment is given at 10 weeks of age, which is about 2 weeks after the pigs are weaned. At least 2 weeks should always be allowed to elapse between the time of the first and second injections.

Male suckling pigs not needed for breeding purposes should be castrated by the time they are 3 to 4 weeks of age. Good results can be obtained by castrating pigs during the first week of their lives. The operation should not be delayed until weaning time or after, because the wounds heal more slowly and the older pigs are bigger and harder to handle.

In castrating the pigs, the cords should be either pulled out or broken off quite a distance forward on the animal. The knife should be kept sharp, and good sanitation is important during the operation. The incision should be made low enough to keep drainage fluids from collecting in the bottom of the pouch.

Some estimate that probably 25 to 35% of all healthy pigs that are farrowed in the United States die by weaning time, and that many of these losses occur in the first 10 days. Further losses after weaning add up to a point where only about 55 hogs are marketed per 100 live pigs farrowed.

Such losses involve heavy wastes in feed, time and other facilities. They stress the need of proper feeding and management in order to overcome such inefficiency.

A summary of results from Larro Research Farm for all Hampshire litters for 1945, shows that:

An average of 11.2 pigs were farrowed per litter.

An average of 10.4 pigs were living at 8 weeks.

These results are in marked contrast to the national average which probably equals considerably less than 6 pigs weaned per litter. The results at the Research Farm, moreover, are based on all litters being handled under routine experimental conditions without attempting to give special attention to any of the occasional weaklings which might otherwise have been saved by pampering.

Farmers Can Take It

Henry J. Beckman

AGRICULTURE is passing through an unprecedented experience. For the past five or six years high production of farm crops has been accompanied by unusually high prices. By the middle of last October tobacco was selling at 410% and cotton at 304% of the 1909-14 base period level. Prices received by farmers for all crops and livestock were 273% of that base period. The income per farm person was then 3½ times the 1935-39 level and 4 times the level during the depression. Living standards had reached a level never before enjoyed by rural Americans.

With present high prices and the atmosphere of prosperity that now prevails in rural life, it is not inconceivable that some misconceptions may arise concerning the honeymoon which agriculture appears to be enjoying. For the returning soldier who has come home to an economy of cheap dollars and high-priced commodities, as well as for any others who, lured by present farm prices, are contemplating a farming venture, a serious study of what has happened in agricultural price cycles during the past fifty years may be profitable.

First of all it must be recognized that agriculture is in the last five-year period of what practically amounts to a 15-year revolution. This revolution in agriculture began in 1935, and the changes that have occurred since then will have a far reaching effect upon agriculture's future. During these past ten years agriculture has changed from an animal-powered industry to a mechanized industry. The change has brought a significant increase in the producing capacity of the individual farm worker and even more increase in the farm family's capacity to produce. Tractors can be operated by twelve-year-old boys; they are alluring challenges for sixteen-year olds. With two young boys to help, a farmer, operating his tractor on three eight-hour shifts, can handle from five to ten times as much crop acreage as he did under the former system with horse-drawn implements.

Extension service agencies have introduced new disease resistant varieties of seed and instituted fertilizer programs that have increased production per acre approximately 20%, resulting in a total production of a third more food commodities than before the

war. In many parts of the United States, great food producing areas depend upon natural rainfall for their crops. It so happens that during the past ten years these regions, for the most part, have escaped serious droughts and their abundant crops, particularly of grain, have added enormous quantities of food supplies to the nation's total. As a result, in each of the last six years, farmers have produced enough food to provide for 50 million more people than they could have fed during the 1935-39 period, assuming the same dietary level.

The most significant thing in any nation's history is the mass migration of its people around which its activities center. During the war years the higher wages and shorter working hours in war industries drew millions of people from the farms, where they were producers, to the cities where they became consumers, instead. As a result there were nearly six million fewer people on farms in 1945 than in the 1935-39 period. During the past fifteen years, while the total United States population rose from 121 to 140 million, the farm population shrank from 32 million to 25 million. Thus the farm segment of the population dropped from 26% to 18%. Many of the marginal operators left their farms for the more lucrative wartime jobs in industry. However, during this same period the efficiency of the farm worker increased tremendously. Using 1935-39 as an index, the production per farm worker rose from 90% in 1919 to 136% in 1945, or more than 50%. This the net result of the 15-year revolutionary period has been a greatly increased income per farm worker and per farm family and a new high in total agricultural income for the nation as a whole. It is this alluring phase of the industry that now offers the greatest temptation to the inexperienced would-be farmer and that contains the greatest danger.

Wise men turn back the pages of history to find guidance for the future. Agriculture may now profit by a bit of retrospect. One of the major developments in the present outlook is that America is changing from a seller's to a buyer's market. Recent declines in key products like cotton lend weight to such conclusions. Agriculture may do well to set her house in order for a new and very different day ahead. Promises of federal support for some farm commodities may lessen agriculture's fears, but careful consideration of just when and where such supports become effective is more illuminating then it is reassuring. Prices of farm products as of October, 1946, are in wide disparity with support prices. Wheat quoted as of above date at $1.94

has a support price of only $1.59 and corn at $1.94 could drop to $1.15, a decline of over 40%. Cotton selling at $37.10 is supported at $22.90 and hogs quoted at $25.70 could drop to $13.05 before support prices would head off the decline. Other ratios are: steers, $22.95 vs. $9.73, and chickens, 35.8c vs. 20.5c. Many farm prices are far above the support prices promised by the government for two years following the close of the war.

It must also be remembered that during the war period Uncle Sam was the great monopolistic buyer. There was an unlimited world demand as is always the case when destruction is widespread. There was no limit to Uncle Sam's money; employment was at an all-time high and there was an unprecedented supply of money in the hands of the buying public.

We now face an industrial revolution within the 15-year agricultural revolution. One-half of the total national energy must now move from war industries to peacetime activity. A total of about 8 million men will be moved from army, navy and air forces into the ordinary pursuits of life. Altogether about 30 million will be faced with the necessity of readjustment. With the shifting of so large a segment of our wage earning people from the security of government jobs with adequate compensation, to the uncertainty of private employment or individual business ventures, some curtailment of the lush spending spree may be expected. In the year 1944, the government purchased nearly 100 billion dollars worth of goods and services. With our national budget cut to less than half of that, the question of maintaining sufficient employment at high enough wages to purchase goods and services enough to maintain a 100 billion dollar turn-over may be a difficult one. Agriculture always shares, often disproportionately, in a depreciation of national and individual purchasing power.

One other important factor must not be overlooked in considering future farm commodity prices. Our foreign exports for 1944 totaled 14 billion dollars, of which agriculture provided about 2 billion dollars worth. In 1946 agriculture's share will no doubt reach 3 billion dollars due to the large shipments of food for relief. It may be only slightly less for 1947, but after another harvest year in Europe these food exports may give place to exports of machinery and industrial products. Lower prices from competing exporters in other lands may further reduce our foreign export income. With lend-lease and UNRRA shipments ending, much will depend upon how

much money foreign countries can borrow. Failing in this, they will turn more intensively to producing their farm commodities at home. All these factors add up to the not unimaginable prospect of farm surpluses and accompanying lower prices in the not too distant future.

What is the condition of agriculture today with regard to the average farmer's ability to stand price reverses if they come? Certainly when we compare agriculture's condition today with that of the last depression we have reason for confidence. The greatest single factor in the last depression, as far as agriculture was concerned, was the heavy farm mortgage indebtedness. Even farmers who were out of debt mortgaged their farms to add to their holdings. In many cases the obligations incurred in speculating on an adjoining farm exceeded the long-time value of both properties. For the most part those conditions do not prevail today. Granted that land prices have again reached an unjustified height, the actual farm mortgage indebtedness declined from 7.5 billion dollars in 1935 to 5.2 billion in 1945, a decline of nearly 31%. Farmer's equities are far more secure than they were then. In 1932 farmers worth of assets. In 1945 they owned 33,155 million dollars owned 66,851 million dollars worth, with an indebtedness of only 7,007 million dollars. Payments on principal exceeded new mortgage loans by 4 to 1 in the year 1943, although the ratio since then has not been so favorable.

Savings and credit resources are now many times as large as in the pre-war period. While in the 1920 collapse mortgage indebtedness was three times the pre-war total, farmers now have a 90% equity in their business. They have enough money in government bonds and checking accounts to more than liquidate their mortgage obligations. With assets ten times their mortgage obligations they have eliminated one of the greatest causes of former depressions.

Other things must be included in weighing the situation. Parity prices for products, if maintained for 2 years more, would ease any decline and prevent such a sudden and disastrous drop as occurred before, within one year's time. Farmers may have enough time to readjust costs to lower levels during that period. Undoubtedly legislation of some kind protecting agriculture will remain in force if other industries continue to enjoy the protection now afforded them, although the cumbersome procedure and unpredictable results of federal regulations are irksome to agriculture in general.

Phychologically farmers will not be caught unprepared for any eventuality concerning prices. The scars of the last depression are burned deeply into the memories of many men whose hands are still on the plow. These men are apprehensive about $26 hogs and $2 wheat. They remember the lean years in Egypt. They have stored their financial reserves against such a day with increased efficiency in production and freedom from mortgage indebtenness and heavy interest charges. Liquidations of calamitous proportions will be unnecessary. The absence of such urgency should be a valuable factor in sustaining confidence in agriculture's ability to withstand the next depression, if and when it comes.

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"Once they are gone, the trees and the grasslands and the clean bright water, the screaming wild fowl, the beaver and antelope, we can only remember them with longing. We are not God; we cannot make America over again, as it was in the beginning. But we can come to what is left of our heritage with a patriot's reverence."

DONALD CURLROSS PEATTIE

Kochia — The Weed That's Feed

Condensed from Farm Journal

Carroll P. Streeter

A WEED that farmers all over the Great Plains have cussed heartily may turn out to be their salvation when the next big drought comes along.

It is nothing more nor less than fireweed—sometimes called fireball, Mexican fireweed, and summer cypress. Botanists call it Kochia (pronounced Coké—ee—uh), Kochia is a name farmers all through middle America will hear much oftener from now on.

For 20 years this weed has been underfoot, its value unrecognized. Yet it is:

1. Practically the equal of alfalfa as hay, silage, and pasture. It has almost as much protein, more carbohydrates, and less fiber—all desirable characteristics.

Cut twice a year, when about two feet high, it makes 2½ tons of high-quality hay per acre. For silage it can be cut at two to five feet.

2. Livestock eat it with relish.

3. It thrives even in a drought.

4. It flourishes on any soil. You can find it growing merrily in the alleys of Kansas City. It even pops out of the cracks in sidewalks.

5. Grasshoppers won't eat it.

6. Yet it becomes no pest the next year. Drag or disk at the right time in the spring and you kill it. The seed germinates early, and any that doesn't sprout will not live over. Plants in a close stand, 20 or more inches high, can be killed if mowed so as to leave no live branches on the stubble.

How come we haven't known about Kochia before? Where has it been all this time? Let's trace the story from the start.

A German botanist named Koch took Kochia from Africa to Stuttgart, Germany, some 50 years ago. Seed importers brought it here as an ornamental, and you can find it in your seed catalogs today as "burning bush." From eastern gardens it escaped to the Great Plains as a weed, and spread to the fence rows and uncultivated land all over that area.

While Kochia grows in many parts of the United States, its chief territory is the Dakotas, Nebraska, Kansas, eastern Colorado and Wyoming. It is found occasionally in Oklahoma and Texas.

That's how Kochia got here, but its discovery as a valuable

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crop waited on the arrival of E. L. Erickson at the agronomy department of South Dakota State College.

Erickson had heard how Dakota farmers had saved their breeding herds, during the long drought of the '30's, by feeding Russian thistles. He figured there must be something better than *that*, even in a drought, so he set out to find a "better weed." He went through the botanical manuals, made a list of everything related to Russian thistles, and analyzed them for forage value.

It was a discouraging lot of stuff. Most of these plants are not particularly leafy. But when he came to fireweed he found it one that was unusually leafy—65% leaves, in fact. Here was a startling discovery. But when chemical analysis showed that it also contained more than 13% protein (almost as much as alfalfa), the possibilities seemed tremendous.

That was five years ago. Since then Erickson and his associates have learned much about Kochia. It's an annual; it grows five feet tall; it produces 1400 to 1500 pounds of seed per acre; it should be seeded at 10 or 15 pounds per acre.

There's plenty, too, that the Dakota scientists *don't* know yet about Kochia. Their research is just well started. One thing they're already trying to do, however, is to develop better strains of this wild crop.

But will stock eat the stuff?

The hay has a pleasing aroma, much like alfalfa. It holds its leaves better than alfalfa, and has a similar green color. I saw cattle and mules quit grazing on bluegrass pasture to come over and eat Kochia hay thrown over the fence. They cleaned up every bit of it, even stems as big around as a lead pencil.

Feeding tests have been preliminary only, but repeated trials have all indicated its value. On one, a bunch of beef heifers gained .97 pound a day on first-cutting Kochia hay, as against 1.18 pounds on alfalfa.

Kochia's place may well be as *feed insurance for dry years*. If a farmer in the Great Plains sowed some Kochia each year he would be sure of plentiful high-protein feed, come drought or not.

Kochia is not a legume, so puts no nitrogen in the soil. In fact, it takes out a good bit. In this respect it is like the grasses. But seed should be cheap, it reseeds itself, and it can lick drought and grasshoppers. Any plant that can do that is quite a "weed."

Of the 300,000 known plants in the world we use only about 2,000. Who knows how many other weeds—perhaps some on your own farm—may some day, too, be discovered valuable?

Federal Crop Insurance

Condensed from Extension Service Review

G. F. Geissler

Manager, Federal Crop Insurance Corporation

THE farmer has waged a battle with the weather ever since man planted his first crop. His weapons have not been very effective. Indians danced in circles round campfires, attempting to bring rain for their corn crops. Other farmers watched helplessly while their crops withered under the sun or disappeared under swirling flood waters. Many farm families have lost their homes and lost their savings —not because of any negligence on their part, but because of natural hazards over which they had no control.

However, producers of wheat, cotton, and flax can now shift the greater part of their worry to the Federal Crop Insurance Corporation of the U. S. D. A., which is offering insurance on a Nation-wide scale to these farmers. The protection offered is against loss of yield due to essentially all unavoidable production hazards such as drought, flood, winterkill, and insect damage. With a guaranteed amount of production, along with the loan and other price-supporting programs of the Department, the farmer can be assured of at least a minimum return on his wheat, cotton and flax crops.

The amount of insurance available to the producers of wheat and flax is optional at either 50 or 75 per cent of the long-time average yield for the farm. Cotton producers have a choice of three levels of insurance which are expressed in actual pounds of cotton rather than as percentages of the average yield. These varying amounts of insurance protection enable a producer to choose the amount which he feels best meets his individual needs.

The amount of insurance protection in all cases is lower in the early stages of production and increases as additional costs are incurred and the value of the crop increases. If the yield produced is less than the amount of insurance guaranteed for the stage of production in which loss occurs, the insured farmer is indemnified. This progressive coverage plan is designed to protect the insured farmer's investment in the crop in the early stages of production and at the same time to provide an incentive to carry it through to harvest. Even in the harvested stage, at which time the maxi-

Reprinted from the Extension Service Review, Washington, D. C., Feb., 1947

mum amount of protection applies, it is still more profitable to produce a normal crop, as even the highest amount of insurance cannot exceed 75 per cent of the normal yield.

The premium rate for most farms is based on two factors. One is the risk of producing the commodity in the area in which the farm is located. The other is the amount of insurance selected by the farmer. The premium does not include any costs of administering the program. These costs are paid by congressional appropriations.

Insurance for all commodities is sold to farmers through county agricultural conservation committees, and losses are adjusted by representatives of the corporation. Each commodity is insured under a different type contract. Flax is insured under a yearly contract, wheat under a 3-year contract, and cotton under a continuous contract which remains in force from year to year, subject annually to cancellation by either party.

The Federal Crop Insurance Corporation is experimentating with insurance on corn and tobacco in a few representative counties. 1947 is the third year of a 3-year trial period on these commodities. The purpose of the experimental program is to determine the most practical plan, terms, and conditions of insurance on these commodities.

Crop insurance is not a get-rich-quick scheme. On the other hand, it is sound businesslike protection. The farmer insures his buildings each year against fire, not to make a profit out of the insurance but to be protected in the event of loss. All the time he is hoping the buildings won't burn because the insurance is never worth as much as the buildings. Likewise, he should insure his crops each year, hoping that he will always produce a bumper crop, but knowing he has protection in the event of failure due to causes beyond his control.

Solving Secrets of the Soil

Condensed from the Land Policy Review

Sir E. John Russell

Former Director of the Rothamsted Experimental Station

LAWES AND GILBERT started the Rothamsted Experiments in Britain over a hundred years ago, but it was some time before they concerned themselves with the soil. Their interest was in the food of plants, recently discovered by chemists and botanists. They showed that when these foods were applied in the form of fertilizers they usually increased the yields. Labor was cheap and abundant and prices were relatively high, there was no need to economize on fertilizers. A generous dose was given and the extra crop paid for it. If there was a certain over dose, no great harm was done.

The first soil work at Rothamsted—Britain's famed Soil Experimental Station in Hertfordshire—was in the 1880's. In British conditions the most uniformly effective fertilizers are those supplying nitrogen; the commonest were and still are sulphate of ammonia and nitrate of soda. There is no great difference between them though nitrate of soda is rather quicker in action and rather more effective. The actual plant food was found to be in the nitrate, and in the soil the ammonia rapidly changed to nitrate. This conversion is not easy in the laboratory at ordinary temperatures, and how it took place in the soil was for long a mystery. Finally, two French chemists showed that it could be brought about in the laboratory by bacteria. Warrington at Rothamsted showed that, in the soil, bacteria were also responsible. For the first time it was realized that soils contained a multitude of living organisms occupied in making plant food.

Meanwhile British agriculture had fallen on evil days, and farmers could no longer afford their easy going methods. Fertilizers had to be used with the strictest economy and Dyer at Rothamsted set out to find a way of discovering by chemical analysis whether a soil really needed potash or phosphate. He devised a method that worked and is still used. Its basis was purely empirical. When A. D. Hall succeeded Lawes and Gilbert at Rothamsted in 1902, he started

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investigations on soil analysis on a sound basis. At that time it was recognized that the potash and phosphate existed in the soil in a variety of minerals, some of which were very resistant while others were easily decomposed; it was only the latter that were of much use to the plant. Hall soon discovered that there was no hard-and-fast line between these two groups; one acid would extract a certain quantity of phosphate and potash, another would extract more. If the conditions varied the amount extracted also varied.

But the problem was more complex, for plants varied in their ability to take up potash and phosphate. In short, there was no such thing as an absolute amount of available potash or phosphate in the soil; what was available to one plant was not necessarily available to another. A solution of the difficulty was found. It was rather roundabout, but typical of the methods scientists often have to use in their work. Hall knew about the excellent soil surveys being made in the United States. In conjunction with the present writer he made a survey of the soils of South-East England using both chemical and physical methods. On similar soils there was a relatioin between the chemical analysis and the response to fertilizers; if a certain acid extracted 0.015 per cent of phosphoric oxide from a soil known to respond to phosphatic fertilizer, then it is safe to assume that another soil of the same type containing the same or a less amount would also respond to the phosphatic fertilizer.

So it was recognized that the areas of similar soils should be mapped, that field experiments should be made to discover the response of crops to fertilizers, and that the crop results should be related to the analytical data. On this basis it has been possible to advise farmers with a good deal of certainty about their manuring, and the method is widely used in the United Kingdom.

Soil analysis has recently been much developed at Rothamsted in a remarkable investigation by E. M. Crowther on the manuring of sugar beet. Manurial experiments are made throughout the sugar-beet regions and also extensive soil analyses by new and improved methods. The results hang together remarkably well and in consequence the advice on the manuring of sugar beet can now be given with much greater confidence than before.

Meanwhile the older work on soil bacteria had been resumed. It was found that soil was continuously taking up oxygen and giving out carbonic acid gas and that this action was mostly due to living organisms. More fertile

soils usually absorbed oxygen more rapidly than those less fertile, indicating that their bacterial activity was greater. When the bacteria were killed by sterilization, oxygen absorption became much less, but when the soil was partially sterilized, thus killing active organisms but not spores, and conditions then made favorable for the germination of spores, the oxygen absorption greately increased as did bacterial numbers. It was found that the natural untreated soil contained large numbers of protozoa which feed on the bacteria and keep their numbers down; these are killed by partial sterilization.

As the methods of investigation improved the numbers of living organisms in the soil were found to be vastly greater than had been supposed. Hutchinson's first counts at Rothamsted showed about 5 to 20 million bacteria per gram in the farm soil (there are about 28 grams to an ounce). The latest methods of H. G. Thornton show about 1,000 times this number. So also the numbers of protozoa revealed by modern methods are considerably greater than by the earlier methods.

What is perhaps more remarkable is that the numbers instead of remaining fairly steady are continually changing even in the course of an hour. The turmoil in the quiet-looking soil is something unimaginable to our sober minds. In addition there are moulds, actinomycetes, and other vegetable organisms besides an extensive animal population ranging from rodents downward; earthworms, insects, nematodes, etc. This amazing population is supremely important in the soils because they are the makers of humus and of plant food.

Humus, formed from decaying plant material, contains all the elements of plant food, but its more important properties are that it helps to hold moisture and plant food and to build up the soil particles into crumbs. Its chemical composition and constitution are complex and difficult to determine, as many scientists in many countries have found out. A vast mosaic of knowledge has grown up; in its accumulation Rothamsted has played its part.

But humus is not the only sticky substance in the soil; there is another of equal importance, the clay. This is mineral; chemically it is entirely distinct from humus, but it has two properties in common with humus which give it its agricultural importance —its ability to hold water and plant food and its power to build up the soil particles into crumbs. It is impossible to exaggerate the importance of crumb formation in soils. Soil crumbs represent life to the plant and the soil; when they fall down to dust it

means death, for the dust is easily blown or washed away and then soil erosion sets in.

Soil erosion is not a problem over most of England but the power of the crumbs to hold water is, for although we have no arid regions our crops often suffer from partial drought. The water relations of our soils are therefore important from the practical point of view, but equally so from the scientific, for they are essential to an understanding of the soil structure. B. A. Keen took the subject up when he came to Rothamsted. It was then usually supposed that capillarity was chiefly concerned in regulating the relations of soil to water, but he showed that this was not so, and he, and later colleagues, found more accurate, though more complex explanations.

Crumb formation is of such vital importance in the soil that many scientists are trying to find out all they can about it. The weather has something to do with it, especially the winter freezing and thawing. Bacteria have an active part. Plant roots are effective, particularly those of grass and clover, as has been observed in the United States. At Rothamsted Laboratory studies of the processes involved have been made by E. W. Russell. The work is complicated by the fact that soil particles can also agglomerate in another way and form clods which behave quite differently from crumbs. They are not at all what the farmer wants though he may easily get them if he cultivates wrongly.

While the scientific work goes on slowly and quietly the scientist has a responsibility to the farmer. The great purpose of cultivation is make a good seed bed and to get what the farmer calls a good tilth. This involves good crumb formation; a bad tilth is more of the nature of clod formation. B. A. Keen started the work of finding the effect of the various operations. Cultivation is in Britain an ancient art and its different operations have developed empirically; meanwhile the implements have changed out of all recognition. Are the time-honored methods all necessary today in our new conditions and with our modern implements?

Frequent surface cultivation used to be regarded as desirable, but Keen could find no good effects apart from the killing of weeds. At present, E. W. Russell is making large-scale experiments in deep ploughing. In the old days it was an article of faith that deep ploughing was essential, especially on heavy soils. With the heavy implements then in use, Britain's heavy loam and clay soils were often very productive, but the ploughs needed some six to eight horses to draw them.

There were in general only two crops on arable clay soils, wheat and beans, so the ploughing was usually done to the same depth each year. In consequence, a hard layer, called a plough sole was formed below the surface at the usual depth of ploughing. This often interfered with drainage and had to be broken up to get the best results—and so grew up faith in deep ploughing.

But that has all changed now. The heavy clays are more and more put into grass, and modern ploughs do not make such drastic plough soles as the old ones, though modern tractor wheels do a great deal of serious compacting. Is deep ploughing still beneficial? The extensive field experiments now being made will furnish the answer.

Soil science has already done much to help agriculture and it will do much more. The combination of field work and laboratory investigations proceed slowly, but it is the surest way to success.

New Pinkeye Treatment

After extensive field trials, a highly effective pinkeye treatment has just been released. Before applying, the pus is removed from the eye and eyelids. Then the powder is blown or dusted upon the infected area. This is done daily, altho more frequent treatment may be given.

In one herd of infected cattle, those which were recognized at an early stage and treated without delay, responded in two days. One animal, blind when first seen, regained its vision after two weeks of treatment.

This preparation has been used daily for 10 days, on eyes of normal cattle, horses, sheep and dogs, without harmful results.

The formula includes tyrothricin, sulfanilamide, sulfathiazole, and phenacaine hydrochloride. The combination of the first three compounds is especially desirable, since some bacteria causing pinkeye are more resistant to one drug than to another. In other words, bacteria which one drug alone fails to kill completely, suffer certain death with another. The fourth compound, phenacaine hydrochloride, is included in the formula because of its local anesthetic effect.

Successful Farming

Profit Sharing with Farm Workers

Condensed from The Farmer

J. B. McNulty

Extension Economist, University Farm

Some farmers are seeking better ways of keeping their hired help satisfied and on the job. One farmer who operates a 160-acre farm is using the following plan:

Each worker is guaranteed a cash wage per month for the calendar year or 25% of the net farm income, whichever is the greater. The wages agreed upon are intended to equal or exceed the going wages of married farm workers in the community. In 1945, 25% of the net income exceeded the guaranteed wage income of each worker by $464.

To keep the workers informed, the employer used his farm accounts to estimate the size of the worker's bonuses for the first six months of the year. The 1946 midyear-estimate indicated that the bonuses would be higher in 1946 than in 1945. The employer advances money for living expenses as requested, but not to exceed the amount due for wages.

The wives of the workers are required to wash the dairy utensils, prepare the eggs for market, and help care for the baby chicks. Extra help needed for such work as threshing and silo filling is boarded by the workers.

Principal sources of income are whole milk, certified seed grains, poultry, eggs, and young stock for breeding purposes. A written contract setting forth the terms of the agreement is signed by the two workers and the employer. A complete settlement is made at the end of the year.

The owner lives on the farm. He manages the business, makes all purchases and sales, pays all bills and keeps the farm accounts. In emergencies he may help with some of the farm work. Both workers live in separate houses on the farm.

Each worker is allowed one-fourth of an acre for a garden, two quarts of milk daily, three dozen eggs per week, and one-third of the dead wood cut for fuel. Workers pay farm market prices for other farm produce used. They also pay for additional fuel, if needed, and for the electricity used in their homes.

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In calculating the net income to be shared with the workers, all operating expenses, including grass seed, ordinary repairs for the machinery and other operating equipment, and a 10% depreciation allowed the owner on his machinery are deducted from total receipts. "Workingmen's insurance" for the workers is also included with operating expenses. Operating expenses do not include the taxes, repairs, and upkeep on the real estate nor the taxes on the personal property.

The plan contemplates that dairy cow numbers will be maintained. Two-year old heifers to freshen within 30 days are accepted as mature cows in making settlements. The value of the increase or decrease in young stock is based on the estimated weights and the average prices received for young stock and cows sold for meat purposes during the year. The owner thinks that a market value instead of sale values of cattle sold from the herd is advisable. The weight of each animal is estimated separately. This method of calculating values of young breeding stock is used to avoid disagreements on valuing this kind of livestock. To be prepared to apply this method for adjusting values for increases or decreases in cow numbers, the weight of each heifer is estimated and recorded when she first freshens.

Quantities of seed, feed, and supplies, as well as numbers and kinds of livestock are inventoried at the beginning and end of the year. Farm market prices for all items except the breeding livestock are also recorded. Equal quantities of feed, seed, numbers of poultry, weights of young stock, and supplies have equal values at the beginning and end of the year. The value of increases in poultry, feed, seed, and supplies at the end of the year is based on current prices at that time. But the value of decreases in these items at the end of the year is based on current prices at the beginning of the year.

Fighting Frost with Ice

Condensed from New Jersey Farm and Garden

William A. Haffert, Jr.

PROGRESSIVE vegetable growers have used irrigation for frost control with marked success for a number of years in New Jersey, but fruit growers have gone them one better, experiences of the past season indicate.

Instead of turning on sprinklers to help keep air temperature above freezing on frosty nights, fruit growers have been deliberately sheathing trees and bushes in ice to protect them.

It is a well-known fact that buds and blossoms can withstand temperatures slightly below freezing, but are killed when the thermometer drops to about 25 degrees. The idea behind this new method is to encase the blossom in ice, which in itself offers some insulation against a sudden, extreme drop, and to keep water flowing on the ice. The air is kept so busy forming new ice from the water that the original ice stays near the 32 degrees at which it froze. If the water supply should fail, the ice would get as cold as the air itself.

Perhaps the first to try this method, believed to have originated in the Pacific Northwest, was Lester Collins, of Moorestown, manager of the Atlantic Company, a large cranberry and blueberry producer near Weymouth. He used sprinklers for five nights in March, 1945, to protect about six acres of the firm's best blueberry patch. Every bush became weighted down with ice, some pieces as much as two inches thick.

Those who saw the field at harvest time could scarcely believe their eyes. The six acres that were sprinkled were bending down with a fine crop of berries, but within 100 feet of where the water stopped they were not worth picking

When it became apparent that frost control would be necessary to protect the early-maturing crop, Collins hastily laid down a checkerboard pattern of portable, quick-coupled pipe. The lines were placed 100 feet apart, with sprinklers every 40 feet on the line.

In the winter of 1945-46, Mr. Collins built a permanent system to cover 24 acres, this time installing steel pipe underground to feed water to the sprinklers above ground. The pipe line is blown

Reprinted by permission from N. J. Farm and Garden, Sea Isle City, N. J., Jan., 1947

out by compressed air in the fall and lies unused until needed in spring. Water pressure is maintained by two engine-driven units pumping 600 gallons each per minute. Water is obtained from two reservoirs, which are fed by a system of ditches.

These units were operated 10 nights during the very early spring of 1946 and a considerably better crop was harvested from this part of the plantation. The difference was not as striking as the previous year, because this time there was a fair crop on the unprotected parts.

The sprinkler system was tried on peach trees in full bloom in March, 1945, at the Barton Brothers, Inc., farm at Haddonfield. The trees were sprinkled during three nights when the temperature went as low as 24 degrees. Lines were laid 125 feet apart and the sprinklers spaced 60 feet apart on the lines. The farm reported that the yield in the protected area was 50 per cent heavier than on the unprotected part of the orchard.

L. B. Daumont installed a complete overhead system on his 12-acre blueberry field near Pemberton in 1946, using portable pipe with quick couplers. The berries bloomed especially early last spring and it was necessary to water the field eight nights. In 1945, when frost took a large toll on this field, the yield was only 50,820 pints. In 1944, the best previous year, the crop was 61,080 pints. But the 1946 crop, under the frost control process, yielded 160,128 pints!

Not all of the increase was due to the sprinkler system, Mr. Daumont points out, but with berries at 20c to 40c a pint net at the field, it adds up to very important money.

His system has 79 sprinklers delivering five gallons per minute each, and is operated by a 600-gallon-per-minute, self-priming pumping unit, powered with a six-cylinder engine. Two-inch laterals lead from four-inch and three-inch main lines. The mains are supported eight feet high on posts made from 1½-inch pipe set into concrete. The sprinkler lines are supported four feet from the ground on three-quarter-inch pipe and the sprinklers themselves are mounted on 40-inch risers. Cost of the equipment, including a reservoir to hold about a half-million gallons of water, was about $6,000.

Despite the fine results he has obtained with watering for frost control, Mr. Daumont finds that a sturdy plant offers the greatest initial resistance to frost and gives the biggest yield. So he waters in dry weather, too. This combination of practices, he finds brings bigger yields of better berries.

Comparing Fertilizer Nitrogen from Various Sources

Condensed from American Agriculturalist

George Serviss

It is still easy to stir up an argument among cash crop farmers over the value of the different sources of nitrogen that are used in the manufacture of mixed fertilizers. Many farmers still remember using fertilizers that contained considerable dried blood, fish scrap, Peruvian Guano, animal tankage, etc. The smell that these materials imparted to a mixture was one that would not be forgotten easily. In fact, some companies in some areas had to put the smell back in for a few years even after taking these materials out.

Dried blood, fish scrap, cottonseed meal, and animal tankage are good sources of nitrogen. That they are any better sources, under most conditions, than inorganic sources or chemical organics is a debatable question. Certainly if price is considered, and price has to be considered, it is very debatable.

The wholesale August price for a unit of nitrogen (20 pounds), in bulk sulphate of ammonia was $1.46, the cost of a unit of nitrogen in fish scrap was $8.14, and in ground dried blood, $12.14. To use any of these materials to supply 1% nitrogen in a ton of fertilizer would throw the retail price completely out of line. For instance, substituting fish scrap for ammonium sulphate so that the fertilizer would contain 1% organic nitrogen would raise the retail price $6.68 per ton.

Today, most of the better organic sources are used for feed. Most mixed fertilizer in this area contains little more true organic nitrogen than is contained in the conditioner. Materials such as garbage tankage, ground cocoa shells, castor pomace, etc., are used as conditioning agents in mixed fertilizers, but even these are becoming difficult to obtain.

Most of the nitrogen in mixed fertilizers today comes from solutions, ammonium nitrate, and ammonium sulphate. Nitrate of soda, which was once used extensively in mixtures, is now used chiefly for side dressing. There are two general types of solution: ammonia plus ammonium nitrate,

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and ammonia plus urea. Generally solutions have been the cheapest sources of nitrogen. They are also excellent sources for crops. The ammonia combines with the superphosphate and becomes quite resistant to leaching while retaining high availability. Considerable absorption of the ammonium nitrate or urea also takes place on the phosphate particles. The use of these solutions also improves condition and cuts down on bag rotting.

Fortunately considerable work has been done by the agricultural experiment stations to determine the value of the different sources of nitrogen. New Jersey conducted four potato fertilization experiments in 1937, 1938 and 1939 with a 4% nitrogen fertilizer. The source of nitrogen and the residual acidity was varied. Where all of the nitrogen was derived from sulphate of ammonia, the average yield was 256 bushels to the acre. All nitrogen from nitrate of soda yielded 261. All nitrogen from sulphate of ammonia plus lime to neutralize the residual acidity yielded 265. Where one half of the nitrogen was derived from sulphate and one half from nitrate the yield was 275 bushels to the acre, and where the nitrogen was derived one third each from sulphate of ammonia, nitrate of soda and animal tankage the yield was 278 bushels.

About the only conclusion that can be drawn from these experiments is that where fertilizer is used at the rate of a ton per acre, the nitrogen should be derived from more than one source.

Considerable work is also available from Maine with potatoes. In one set of tests conducted from 1920 to 1926 with cobblers the average yield per acre where all the nitrogen was from nitrate of soda was 286 bushels, all from ammonium sulphate 300 bushels; one third from nitrate of soda and two thirds from ammonium sulphate, 308 bushels. Where one fourth of the nitrogen was from nitrate of soda, one fourth from sulphate of ammonia, and one half from fish meal, the yield was 316 bushels. Where the nitrogen came one fourth from nitrate of soda, one fourth from ammonium sulphate and one half from cotton-seed meal, the yield was 307 bushels to the acre.

In another series of tests at Maine with Green Mountains on the permanent fertility plots conducted for three years, the yield where all of the nitrogen was derived from fish meal was 359 bushels; and where one half of it came from nitrate of soda and one half from sulphate of ammonia, the yield was 388 bushels. There was considerable variation from year to year. The chief conclusions seem to be that more

than one source of nitrogen in the fertilizer is usually desirable, at least with potatoes; that there were no outstanding advantages from organic sources, which were higher grade materials than those generally used today; and that they certainly would not be worth what they would cost today. In other tests, mixtures containing ammonium nitrate and urea gave very satisfactory results.

There is no question but that organic matter is a very important constituent of soils. The amount that is added to a soil by the application of a fertilizer carrying 100 to 150 pounds per ton of an organic conditioner is insignificant. Even our poor Northeastern soils will contain 20,000 pounds of organic matter to plow depth, and the average organic matter content of New York soils is around 80,000 pound to the acre to plow depth.

Where it is desirable to add organic matter to a soil, barnyard manure, green manure crops, and cover crops are the most satisfactory sources, since they supply sufficient quantities to have a measurable effect. It is possible and often practical, too, to convert cheap inorganic nitrogen to organic nitrogen by fertilization of a non-legume cover crop. For instance, the amount of organic matter produced by a rye or ryegrass cover crop can be greatly increased by fertilizing with nitrogen. Legume crops will supply substantial quantities of organic nitrogen without fertilization with nitrogen. For instance, turning under a crop of alfalfa that would yield two tons of cured hay to the acre is equivalent to applying three to four tons of about 2½% nitrogen fertilizer, since the dry weight of the roots will usually total one or two tons.

There are, of course, special conditions that may justify the inclusion of a special source of nitrogen, just as there are special conditions under which it is desirable to use some sulphate of potash in the fertilizer rather than all muriate. These conditions, though, are exceptions and not the rule. For most conditions there is not as much difference between the efficiency of the various nitrogen materials as many used to think. If we use lime to keep the pH within the desirable range for the crops being grown, replenish organic matter by application of barnyard manure or the growth of green manure and cover crops, we will find it difficult over a period of years to measures differences between the various sources of nitrogen.

Seed Growing — a New American Industry

Condensed from The Rural New Yorker

In the past 25 years American seed growers have developed a gigantic vegetable and flower seed growing industry in the United States until today we produce not only seeds sufficient to plant our own crops, but in addition we export many to other countries.

Although many States now produce commercial quantities of seeds, California is easily the leader in the seed growing industry. On their vast seed farms are produced exceptionally fine vegetable and flower seeds in carload lots. For more than 500 miles south of San Francisco there are fertile, wide valleys spreading toward towering mountains and the sea, that are devoted to seed production. This great garden, the largest in the world, is accepted as the most natural seed growing empire. Here the climate is wonderfully suitable and there are a score of districts in California, where seed farms, or ranches as they are called, are producing seed in commercial quantities. These are located along the coast between San Francisco and Santa Barbara. The original home of the industry is the famous Santa Clara Valley, near San Jose, extending to the outstretching valleys of San Juan and Hollister. The Coast Range shuts the sea away, though the climate is modified in the neighborhood of the sea, blended with the coast air and the warmer and drier atmosphere of the interior. This makes an ideal seed growing combination. In the Arroyo Grande and Lompoc Valleys, sweet peas are grown in enormous quantities. Here the soil is light and fine in texture, and adapted to the production of the rarest seeds. Here various soil textures abound in sufficient areas for the production of commercial crops of any given variety of flower or vegetable seed. Alluvial soil, morning and evening fogs and the usually warm, clear days, provide a combination of conditions that have resulted in the production of some 2,000 varieties of flowers, representing more than 200 different species. The Santa Maria and Lompoc valleys produce more sweet pea seed than any similar area in the world. More than 100 distinct color classifications are used to describe their types. The sweet pea seed crop is planted just before Christmas, the flowers appearing in greatest profusion about the middle of May, the growth takes place during the cooler season.

These seeds are planted with

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mechanical devices, seeding eight rows at a time, and are harvested with mowing machines. After drying, the masses of vines are rolled up in canvas sheets and left drying on the ground to await the threshing machine. The workers are up to their waists in flowers, continually on the look out for sports, cross-breds and rogues. As the growing season advances, the workers are busier, since the tendency to variation is constant and demands the most careful vigilance on the part of the grower to secure purity. From the sports have been originated some of our rarest flower and vegetable seeds, while the rogues are those plants lacking proper strength to maintain a standing in their present stage of development, and which revert to a lower standard, and must be removed from the harvested seed crop, lest its original value be reduced. Thus seed growers are continually cross-breeding on experimental plots for the purpose of originating new varieties, which may possess rare qualities and bring forth improved species. The noted Countess Spencer sweet pea made one seedsman famous and wealthy, his methods revolutionizing seed cultural methods, which led to the improvement of scores of our popular flower and vegetable stocks. Also, it blazed the way to originating many new species from common varieties. On the large seed farms a staff of skilled plant experts may be found, selecting and hybridizing new species. It is a game of ever working upward and onword, never resting content merely to "just grow seed."

Until the advent of World War I, the major part of our seed for farm, garden and flower beds was imported from many foreign lands. But the British blockade closed the sea to imports, and our energetic farmers immediately set about creating a domestic seed growing industry capable of meeting our demands. Today California leads also in the production of rare onion, carrot, lettuce, radish, and spinach seed. Among the other classes of vegetable seed raised on a smaller scale are parsley, parsnip, endive, beet, salsify, chicory, mustard and celery. The largest increase in seed acreage was observed in Sacramento, Yolo and San Joaquin Counties, where the bulk of the carrot, onion, beet and spinach seeds are produced. At the opening of the first war, we depended exclusively on Germany for our supply of sugar beet seed. Compelled to grow our own, we soon discovered that our soil and climate would produce a superior sugar beet seed. In California, this seed is raised on a big scale bottom lands of the Sacramento in both valley and coast regions, the largest area being the rich

bottom lands of the Sacramenta Valley.

Of the common garden seeds, those of the peas form the most important single item. Since 1860, the chief localities engaged in producing them have shifted Westward from New York to Idaho, Montana and California. Irrigation has been a factor in this shift, but it has come chiefly because growing peas for food is usually more profitable than growing them for seed. This led the Eastern regions, which grow canning peas, to depend on seed growers in the West, where canning is unimportant. Bean seed growing likewise changed from the East to Nebraska, which also grows a major part of the nation's sweet corn seed. Rocky Ford, Colorado, is the leading muskmelon and cucumber seed area. Colorado produces watermelon seed, as do Florida and Texas. California leads again in turnip and radish seed, while Michigan is a leader in cucumber seed production. The seed crop is harvested in October, after frost has killed the vines and softened the fruit; it is then passed between two wooden rolls with lugs running diagonally, which mesh together and crush the cucumbers. The pulp runs into a large cylindrical screen, the seeds and juice passing into a pit lined with cloth, the rinds and coarse pulp passing out the end of the screen. The seed remains in the pit until it has thoroughly fermented, which loosens the small envelope covering each seed. Then the seed is washed and dried. Toledo, Ohio, is our leading seed clover center; and Southern States and California supply seed rice; New York and Pennsylvania supply a million bushels of buckwheat seed; Kentucky, Missouri and Iowa produce bluegrass seed, Illinois is noted for its production of excellent hybrid seed corn.

Many of the rarer seeds are threshed by hand. When the seed pods have set, the entire plant is pulled up and laid with its flowers on a large canvas sheet to dry in the sun. Some varieties drop their seeds automatically after the drying process; others require no more labor than a vigorous shaking; but many species must be beaten with flails. The seeds fall on the canvas and are swept up and packed in sacks. Some seed species call for special handling, on account of their peculiar manner of bearing seed. Seeds of the handsome variegated salpiglossis, for example, are contained in a small upright pod, open at the top; if the mature plants are handled roughly or are inverted by chance, the seeds fall out and are lost. After the curing process, each plant is held by the stalk and the seeds carefully shaken out. E. W. G.

Pullets Pay Better

Condensed from Poultry Tribune

Dr. T. C. Byerly

Senior Poultry Husbandman, U. S. Department of Agriculture

LAYING flocks consisting entirely of pullets should be kept on most general farms and on many commercial farms.

Chickens lay about 20 percent more eggs during their first year of production than during their second year. The extra eggs are laid during the fall and winter months when egg prices are relatively high and good eggs are in short supply.

All-pullet flocks yield maximum amounts of meat from cockerel pullet roasters raised incidental to flock replacement and from fowl discarded in good flesh at the close of the first laying year.

Many Leghorn hens are retained for a second year because, it is argued, the cost of raising replacement pullets more than offsets the lower egg production of the hen. This is seldom true; about 25 pounds of feed are required to rear a Leghorn pullet to laying age, and about 18 to feed a Leghorn hen during the molting period when she lays few or no eggs. A half dozen extra winter eggs from the pullet will pay for the 7 pounds of feed difference.

Inventory loss; that is, the decline in value of the pullet from the time she is housed to the time she is sold for meat, is a paper loss. It may be a real factor in determining the relative profitability of light and heavy breed layers, but has little bearing on the income from pullet and hen flocks.

Egg production per hen has increased more than 20 eggs during the past 10 years. If this increase continues during the next few years, fewer farm-raised chickens will be produced as roasters and fowl incidental to flock replacement than in past years. The constantly increasing production of commercial broilers and turkeys will supply poultry meat to satisfy our growing population, but it will not satisfy those consumers who want roasting chickens and fowl. Roasters do return a profit on most general

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farms, and all-pullet flocks will increase the number available.

On the general farm, maintaining an all-pullet flock usually is the only way to avoid mixing hens and pullets together in the same laying house. Mixed flocks of hens and pullets expose the pullets, often for the first time, to such diseases as the old hens may be carrying. Pullets reared in clean houses, on clean ground, may acquire coryza, pox, or even pullorum from old hens.

All-pullet laying flocks are desirable for every farm which lacks adequate housing with which to separate pullets and hens at all times. Barracks houses or range shelters for housing the best old hens while they finish their laying year will permit the farmer to clean and disinfect his laying house in preparation for housing pullets. On most general farms, range shelters or barracks houses for this purpose do not exist. Until they can be provided every hen should be sold before the pullets are five months old, so that the laying house may be made ready for the pullets.

Poultry diseases are spread in many ways; some by transfer of infective material on attendants' shoes or in dirty crates, feed bags, or by any other mechanical means of transfer. Others, such as pullorum, spread through the egg, then by contact with infective material. Most poultry diseases, though, are spread by association of healthy with infected poultry.

Infected birds which are spreaders of disease may appear to be in perfect health. In general, older birds are more likely to be carriers of disease than younger ones. Segregation of chicks from old hens has made it possible to rear those chicks with little brooding mortality. Segregation of pullets from old hens will make it possible to reduce laying house mortality.

The poultry industry lost more than $100,000,000 worth of layers in 1945 alone. All-pullet flocks won't eliminate all mortality, but they will help to reduce it.

The percentage of pullets in farm laying flocks on January 1 has increased from 61 per cent, the average for the 1931-35 period, to approximately 68 per cent on January 1, 1947. This change in percentage of pullets in flocks has been accompanied by a shift in the seasonal patterns of egg production and egg consumption, as well as contributing to the approximately 20 egg increase in average number of eggs produced per layer during the same period.

The average production per layer during the months of September-December, inclusive, in the years 1925-27 was about 22 eggs; during the same months of the 1936-38 period, egg produc-

tion per average layer on hand was about 28 eggs; and, during the 1943-45 period, egg production for these same months reached 34 eggs per layer.

This increase in egg production during the high price—short supply season in the fall was the direct result of the production of more early-hatched bred-to-lay pullets. Mature pullets lay twice as many, and often more, eggs during these months as the same birds lay as yearlings at the close of their first laying year.

Increased fall and winter production has reduced the price differential between the fall and winter period and the spring period. However, fall consumption of eggs has increased as good eggs became more readily available, and relative cost of egg production dropped, due to increased rate of lay.

About 12.5 pounds of feed were required to produce a dozen eggs at the 1925-27 fall rate of lay, while only about 9 pounds per dozen were required at the 1943-45 fall rate. At present feed prices, this represents a drop in cost of production of 14 to 18 cents per dozen. An increased supply of fresh eggs during the fall and winter will help maintain the high rate of egg consumption reached during the war years. All-pullet flocks will help increase production per layer, number of eggs consumed, and producers' profit.

Alfalfa for Hogs

Now that protein supplements for your hogs are scarce and high-priced, good alfalfa pasture may solve your problem. At least a 3-year test at Indiana's Purdue University makes it worth thinking about.

Different lots of spring pigs were fed from 75 to 200 pounds. All were on pasture and self-fed shelled corn, a mineral mixture and salt.

One lot was fed no protein supplement, five lots a 35% supplement self-fed to different weights (100, 125, 150, 175, 200 pounds), and a seventh was hand-fed supplement, 1 pound per hog, twice a week.

In all tests the cheapest gains were made by the pigs getting no supplement.

As was expected, the pigs fed supplement gained faster, reaching 200 pounds an average of a week ahead of the lots getting no supplement. However, using 1944-45 feed prices (corn, $1.12; supplement, $60) the cost per 100-pound gain was 50 cents higher for the pigs fed supplement to 175 and 200 pounds.

—*Farm Journal.*

Rose Farmers

Condensed from Farm and Ranch

Malcolm Orchard

AT THE TURN of the century, a few scattered farmers in Smith county, Texas, had learned that roses would grow so well in their soil and climate that more income could be earned from the culture of these plants than from the production of cotton and other usual crops.

At the same time, budding came into general use as an improved method of propagation. This was the beginning of a tremendous business, running into millions of dollars.

From a few growers, the rose industry, in an area within a 50-mile radius of Tyler, Texas, has grown until today there are over 238 growers producing over 13 million rose bushes each year.

The growers of the East Texas Rose Growers' Association produce about two-thirds of the roses grown in the United States. Also, they claim to be the largest rose-producing area in the world.

Besides the rose growers' association, the Tyler farmers have also organized the Texas Rose Research Foundation, Inc., and have employed Dr. E. W. Lyle, formerly of the Texas Agricultural Experiment Station, to head rose research in the organization.

Dr. Lyle points out that it is no accident that the rose industry is centered in East Texas, but rather the result of a peculiar set of economic soil, and climatic conditions. Preliminary general nursery experience and the gradual development of rose growing resulted in the concentration of skilled nursery labor and rose-production experts in the Tyler area. The long growing seasons with maximum hours of sunshine, an average of 43 inches of rainfall well distributed throughout the year, and fairly reliable November frost dates insure properly developed and ripe plants for December harvest.

That the soil is excellently adapted to rose culture is shown by many years of success with this plant. Being sandy, it permits the planting of cuttings directly in the field, which cuts down the cost of production. The soil has a slight acid reaction which is desirable for good rose growth. No insects of any importance attack rose bushes in this area. Many important diseases common elsewhere are likewise unimportant in this section.

Reprinted by permission from Farm and Ranch, Dallas, Texas, Jan., 1947

An equivalent of about 180 carloads of plants is shipped each year.

A large amount of the rose stock is shipped by parcel post, express, and motor freight. The roses are sent to all of the 48 states and to more than 25 foreign countries, including some of the Pacific islands and Newfoundland.

The production of a rose plant in the farmer's field is much the same as the production of other crops. The soil should be well fertilized and well prepared to get the best results. A soil with plenty of organic matter will produce the best roses. Modern farmers in Tyler broadcast 250 pounds of 20% acid phosphate per acre and plow this in. This is done in the early fall.

In January and February the fields are bedded in rows 5 feet apart. Cuttings 8 inches long are set in the row at 6-inch intervals. In May the farmer begins to knock down the beds. The cuttings are well rooted by this time, and the tops are beginning to develop rapidly. From May until November the farmer cultivates his roses as needed to keep them free from grass and weeds. Also, from July to November he will bud his cuttings to the types of roses he plans to produce. There are over 4,000 varieties he can select from, but only about 500 are grown to any extent, 200 generally grown, and only 25 that can be considered regulars.

During February and March of the second year, the farmer is busy cutting away the understock tops. In April he begins cultivation and hoeing again. About May first he starts spraying for black-spot disease and during this month he cuts the blooms off the top-heavy canes to prevent wind breakage. The rest of his job is a maintenance job until the fall of the third year, when he may begin to dig and harvest his crop. During the harvest, the plants are graded, pruned, packed and shipped. Some are stored in cold vaults.

Storage is a big problem to these producers. Roses in the South may be set out in the fall. But roses in other parts of the nation are usually set in the spring. Since roses in East Texas should be dug in the late fall and winter, those to be planted in the spring must be stored.

But as profitable as this crop may be, the necessary investment and the hazards are enough to stamp the rose grower as an optimist. The average investment per acre for the two-year period necessary to produce a crop runs well over $400. Add to the high investment the perishable nature of the product, plus the possibilities of windstorm, drouth, frost, and the fluctuating market, and it can be seen that the rose farmer

doesn't necessarily make for himself a bed of roses.

Of increasing importance in Tyler is the dehydration and sale of rose petals for eastern perfume manufacturers. This business was started by the late J. C. Ratsek, of the Tyler Experiment Station, and has been successfully carried on after his death by Mrs. Ratsek. She contracted with certain nurserymen for their rosebuds, which she picks, dries and ships to Eastern markets.

There are a few cut roses sold; some in roadside stands and some in distant markets. With the development of faster transportation, it is believed that Tyler may become a center for the sale of cut roses.

How Oats Stand Up

Apparently it makes a lot of difference what kind of oats you have whether they'll stand up on highly fertilized soil.

In 1945 the Iowa Station ran tests with different varieties of oats on a highly fertile soil (Clarion loam) at the Agronomy Farm, Ames, and on a less fertile soil (Carrington loam) at the Experimental Farm, Howard County.

Nitrogen fertilizer was added as ammonium sulfate at the rate of 40 to 80 pounds of nitrogen to the acre. The treated plots were compared with others not fertilized.

Here were the results with two of the varieties using 40 pounds of nitrogen: Clinton, 15 bushel average increase, no lodging; Tama, 11 bushel increase, lodging increased from 5 per cent without fertilizer to 26 per cent with nitrogen. Lodging with 80 pounds of nitrogen was: Clinton, 5 per cent; Tama, 55 per cent.

These results are for only 1 year. Results on other soils and in other years might be different.

—Iowa Farm Science

Add to Profits with Capons

Condensed from American Poultry Journal

Eugene Spratt

If you are looking for a better means of making your poultry flock more profitable and of adding more diversification to the farm, raising capons may hold the answer.

Capons are gentle and easy to raise, offering no problem when placed with growing pullets on range. This allows fuller use of equipment and greater efficiency in handling the flock, since they may be kept together and one man can handle more birds. Capons never crow, which should suit the backlotter and his neighbor.

Capons command as high prices as young turkeys during most of the year; as a matter of fact, a random study of 1946 markets shows that capons received about 36.7c per pound live weight up until mid-fall, whereas young turkey hens averaged only 35c per pound. This readily shows that, with the exception of the holiday season, capons bring top market prices. Even during the holiday season, they will bring premium prices that are not far behind the traditional holiday bird.

Capons can be, and are, grown the year 'round, and the availability of started capons at practically any time desired makes capon growing as simple as growing laying pullets. The problems of hatching, starting, conditioning, caponizing and convalescence have all been taken care of before the actual grower receives them.

Many of those who have been in the capon business for a number of years have developed special markets for their quality birds. Hotels, cafes and private homes all provide special markets; once shown the quality and flavor of choice capon meat, they are sure to be repeat customers.

Here is what a big hotel in Philadelphia, Pa., says: "If capons were available, we would be pleased to offer them on our menu more regularly than at present. We have been fortunate enough to secure them occasionally, and when they are on the menu, we have noticed that many of our guests prefer them to other meats or fowl."

One of the reasons why capons have not received the attention they deserve is that the vast markets possible have not been edu-

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cated to the delicious quality of capon meat, nor of its efficiency. This factor is especially important to restaurants and hotels, since capons lose less in dressing than practically any other type of poultry. Another important item is that poultry raisers in many cases have not realized how cheaply gains may be made with capons, nor the premiums received for quality birds.

There are several hatcherymen that now make it a specialty to caponize their male stock at the age of 2 or 3 weeks, then they sell them shortly after convalescence (in about a week) or even at 6 to 8 weeks of age so that when the birds arrive on the poultry farm they are ready to be placed with other growing stock and forgotten until time to put the finish on.

Buying sexed pullets, then using the rest of the poultry house equipment for started capons will pay well. Capons will usually be finished in about 7 months, about the same age pullets reach maturity. An important point is that capons should be sold when they are finished, regardless of age or weight. A capon will only fatten properly once and failing to sell then will only increase feed costs and will cut the quality of the bird.

The art of performing the operation on young birds has been simplified until it is easy to learn, and with only a minimum amount of practice, a person can become adept at caponizing. There are booklets available that are profusely illustrated, and with only a little study, caponizing can be mastered.

Two methods of caponizing are used, one has been used for many years and gives satisfactory results. This method is through the use of mechanical instruments and provides little difficulty in mastering.

A new method that has come into use during the past few years and is giving good results is the use of electricity. The instruments are powered by an ordinary car battery or a transformer on a regular power outlet. Either method is considered good; however, a big advantage is claimed for the electric way in that most slips can be eliminated much more readily than with the older mechanical method. A slip is a bird that is caponized, but had a small part of the testicle left in, thus causing the bird to become staggy like a normal male, but of no value as a breeder.

Ample proof that caponizing methods have been simplified is shown by the fact that it was formerly thought cockerels should be 8 to 10 weeks old before operating. Now, however, better understanding of the operation and improved equipment has made it

possible to caponize chicks 2 or 3 weeks old. A few hatcheries have taken advantage of this fact and are able to furnish their customers chicks already caponized.

Contrary to popular opinion, it is not necessary to raise one breed for laying hens and have a different breed for capons. In fact, birds weighing from 9 to 11 lbs. bring the highest prices, and any of the heavier breeds of popular laying flocks will reach this weight in about 7 months. R. I. Reds, New Hampshires, Plymouth Rocks, as well as Crossbreds all make excellent capons. Such breeds as Jersey Giants and Cochins will weigh more than the above breeds when finished and will meet the requirements of those who want real heavy capons.

One important point often overlooked is that Leghorn males that have more or less been discarded as market meat birds will produce a nice capon in about the 7-month period. The Leghorn capon will weigh around 6 or 7 lbs.; it may not bring as high a price as some of the heavier breeds, but the initial cost of young birds will be less than many of the heavier breeds, also they will find a ready market since many housewives prefer the lighter weight.

Capons will provide the farm with a good mid-winter income, consume much of the waste feed, allow greater use of already owned poultry equipment, and will yield a higher return for the poultry flock than if the cockerels were sold as friers. It will pay the progressive poultryman to investigate the possibilities of caponizing or buying ready-caponized birds this spring as a valuable asset to his farm enterprises.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUG. 24, 1912, AND MARCH 3. 1933

of the Farmers Digest, published 11 issues a year at Ambler, Penna. for October 1, 1946

State of Pennsylvania | ss
County of Montgomery |

Before me, a Notary Public in and for the State and County aforesaid, personally appeared L. Bush-Brown, who, being duly sworn according to law, deposes and says that he is the busines manager of the Farmers Digest and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor, managing editor and business manager are: Publisher, L. Bush-Brown, Ambler, Pa.; editor, L. Bush-Brown, Ambler, Pa.; assistant editor, C. Leavitt Dyer, Baltimore, Maryland; business manager, A. E. Heick, Ambler, Pa. 2. That the owners are: L. Bush-Brown, Ambler, Penna.; C. Leavitt Dyer, Baltimore, Md.; A. E. Heick, Ambler, Penna.
3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: none. Signed, L. Bush-Brown, Publisher.
Sworn to and subscribed before me this 11th day of October, 1946. (Seal). J. A. Cassidy, Notary Public. (My commission expires January 5, 1947.)

FOR THE FARMER'S LIBRARY

These books are recommended [illegible]

Animal Sanitation and Disease Control—By [illegible]
School of Veterinary Medicine, Kansas [illegible]
Printers and Publishers. $2.50.

Breeds of Livestock in America—By [illegible]
of Animal Husbandry, Iowa State College. [illegible]

Dairy Cattle Feeding and Management—[illegible]
son, Prof. of Dairy Husbandry, W. [illegible]
S. Putney. John Wiley & Sons, Inc. [illegible]

Dairy Science—By W. E. Petersen, Ph.D., [illegible]
Univ. of Minn. By R. W. Gregory, A. B. [illegible]

Diseases and Parasites of Poultry—By [illegible]
Berkeley, Calif., and L. E. Card, Ph. [illegible]
Univ. of Illinois. Lea & Febiger. [illegible]

Farm Management—By Robert R. [illegible]

Feeds and Feeding—By F. B. Morrison, [illegible]
Animal Nutrition, Cornell Univ. [illegible]

Forestry in Farm Management—By [illegible]
John Wiley & Sons, Inc. $3.50.

Grow Your Own Fruit—By M. G. Kains, [illegible]
Prof. of Horticulture, Penna. State Col[illegible]

Livestock Judging Handbook—By [illegible]
Beeson, Ph.D., Asst. Professors [illegible]
state Printers. $3.25.

Making Pigeons Pay—By Wendell M. [illegible]
U.S.D.A. Signal Corps. Orange Judd [illegible]

Modern Agricultural Mathematics—By [illegible]
Dept. of Mathematics, Newtown High School, [illegible]
Publishing Co., Inc. $2.00.

Natural Principles of Land Use—By Edw. [illegible]
Div., Soil Conservation Service. Oxford [illegible]

Onion Production—By Donald Comin, [illegible]
Exp. Station. Orange Judd Publishing Co., [illegible] (19[illegible]

Pay Dirt—Farming and Gardening with [illegible]
Devin-Adair Co. (1945). $3.00.

Practical Farming for the South—By [illegible]
Rural Education, Atlanta Univ. Univ. of [illegible]

Profitable Poultry Keeping—By H. [illegible]
Husb., Penn State College. Orange [illegible]

Repairing Farm Machinery—By [illegible]
Education, Purdue Univ. The [illegible]

Successful Poultry Management—By [illegible]
of Poultry Dept., Univ. of Maryland. [illegible]

For the convenience of our readers, [illegible]
Department. Address [illegible]

Over those parts of the earth not covered by water lies a thin crust of soil, perhaps equal by comparison to the thickness of a sheet of tissue paper wrapped around a globe six feet through. Much of this soil is inaccessible for cultivation or it is unusable for other reasons. From the rest, the world's growing population, now more than two thousand million, must draw all their sustenance except what they get from the sea; and even the fishes, like all other living things, are fed in the final analysis out of the fertility of the land. Whether this thin layer of soil is to be a wasting asset or one maintained in perpetuity and made more fruitful for mankind will depend on how it is used and managed. Nothing more deeply concerns the well-being of men and nations. FAO is dedicated to furthering good use and good management, in all ways and by all peoples, of this most basic of mans' resources.

—*From Report of* UNITED NATIONS INTERIM COMMISSION ON FOOD AND AGRICULTURE